

SELECTED

SWATERRESOURCES ABSTRACTS



VOLUME 6, NUMBER 21 NOVEMBER 1, 1973 SELECTED WATER RESOURCES ABSTRACTS is published semimonthly for the Water Resources Scientific Information Center (WRSIC) by the National Technical Information Service (NTIS), U.S. Department of Commerce. NTIS was established September 2, 1970, as a new primary operating unit under the Assistant Secretary of Commerce for Science and Technology to improve public access to the many products and services of the Department. Information services for Federal scientific and technical report literature previously provided by the Clearinghouse for Federal Scientific and Technical Information are now provided by NTIS.

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SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Resources Research, U.S. Department of the Interior



VOLUME 6, NUMBER 21 NOVEMBER 1, 1973

W73-13001 -- W73-13650

The Secretary of the U. S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities for water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of America's "Department of Natural Resources."

The Department works to assure the wisest choice in managing all our resources so each will make its full contribution to a better United States—now and in the future.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the Water Resources Thesaurus. Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCU-MENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on inside back cover.

Supplementary documentation is being secured from established disciplineoriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Resources Research and other Federal water resources agencies with which the

Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Resources Research
U.S. Department of the Interior
Washington, D. C. 20240

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ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

02. WATER CYCLE

2A. General

SIMULATION OF COUPLED LEAK AQUIFERS AND SURFACE-WATER SYSTEM, New Mexico Inst. of Mining and Technology, Socorro. Dept. of Geoscience.

Z. A. Saleem.
Available from the National Technical Information Service as PB-222 464, \$3.75 in paper copy, \$1.45 in microfiche. New Mexico Water Resources Research Institute Las Cruces Technical Completion Report No 017, 1973. 70 p. 15 fig. 1 tab, 58 ref, append. OWRR A-028-NMEX (2). 14-31-0001-3231.

Descriptors: Hydrogeology, Water wells, Drawdown, Recharge, Transmissivity, "Groundwater movement, "Computer models, Hydraulic conductivity, Water table, "Aquifers, Artesian aquifers, "Hydrologic models, "New Mexico. Identifiers: "Leaky aquifers, Surface-water system, "Multiaquifer systems, Discharge, Shallow aquifer, Two-aquifer system, Three-aquifer system, Nonlinear partial differential equations, Storativity, Semi-provious lawer. Saturated Storativity, Semi-previous layer, Saturated thickness, Roswell-Artesian Basin, Pecos Basin, Aquitards

A numerical model for simulation of groundwater A numerical model for simulation of groundwater flow in multiaquifer systems was developed. A system of nonlinear partial differential equations, isomorphic to groundwater flow in the mul-tiaquifer, was formulated in a finite difference form suitable for the line successive overrelaxa-tion technique. The resulting system of difference tion technique. The resulting system of difference equations was solved using an efficient algorithm. The results derived from the numerical simulator for the flow to wells in two coupled aquifers were in good agreement with analytical results for the system. Analytical models of steady groundwater flow in a three-aquifer system which consists of a valley area containing a shallow aquifer and a deep aquifer coupled through an aquitard, and a highland area containing an intake-area aquifer, were derived. Four cases of the system were analyzed: in two of the cases, the vertical variaanalyzed: in two of the cases, the vertical varia-tions of the hydraulic head in the shallow unconfined aquifer were assumed small; and for the other two cases, an approximate differential equa-tion to describe the flow in the unconfined aquifer was presented. The results indicated that a variation in the hydraulic characteristics of any one of uon in the hydrautic characteristics of any one of the three aquifers affected the flow in all three aquifers and the leakage coefficient of the aquitard played a key role in governing the flow in the system. (Creel-New Mexico) W73-13014

THE EFFECT OF URBANIZATION ON RU-NOFF QUANTITY, Delaware Univ., Newark. Dept. of Civil Engineer-

For primary bibliographic entry see Field 04C. W73-13032

HYDROLOGIC RESPONSE SACHUSETTS WATERSHEDS. OF MAS. Massachusetts Univ., Amherst. Dept. of Civil En-

gineering.

J. M. Colonell, and G. R. Higgins.

Water Resources Bulletin, Vol 9, No 4, p 793-800,
August 1973. 3 fig, 2 tab, 6 ref.

Descriptors: *Rainfall-runoff relationships, *Massachusetts, *Statistics, Variability, Data collections, Hydrograph analysis, Hydrographs, *Watersheds (Basins). Identifiers: *Hydrologic response function.

Hydrologic response, defined as the annual direct runoff divided by the annual precipitation, was

computed for 21 watersheds in or near western Massachusetts, using a total of 232 years of hydrologic records. Variability of the results over the period of analysis was greater than is desirable to inspire confidence in the usefulness of the hydrologic response function; however, the results do suggest that the hydrologic response concept, with appropriate refinements, could be applied successfully to the problem of delineating hydrologic provinces and determination of drainage and storage in unregulated watersheds. (Knapp-USGS) W73-13034 computed for 21 watersheds in or near western

SOME PROBLEMS IN STOCHASTIC HYDROLOGY, Texas Univ., Austin. Center for Research in Water

Resources. L. R. Beard.

Water Resources Bulletin, Vol 9, No 4, p 633-638, August 1973. 3 ref.

Descriptors: *Stochastic processes, *Synthetic hydrology, *Simulation analysis, *Statistical methods, mathematical models, *Estimating, *Forecasting, Identifiers: Stochastic hydrology.

In order to decrease the uncertainty that results in water resource planning and management studies due to the assumed recurrence of historical hydrological sequences, considerable study of hydrological sequences, considerable study of stochastic processes in hydrology has taken place during the past 10-15 years. The general objective has been to develop a capability for generating a number of valid sequences, each of which could as reasonably occur as could a recurrence of past events. A number of serious problems have been encountered, the consequence of which has been a serious lag in the application of stochastic processes to real planning and management problems. These problems include an inability to generate droughts in some cases that are as ex-treme as have occurred historically, the generation of inconsistent values of streamflow at locations on the same stream, the lack of mathematical techniques for the management of incomplete data techniques for the management of incomplete data sets, a great increase in the computation required for planning and management studies, and theoretical and computational difficulties in ex-panding the scope of stochastic hydrology from monthly quantities to short-period quantities. (K-napp-USGS) W73-13039

WALER AND LAND RESOURCES IN EDEN VALLEY, WYOMING, Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering. For primary bibliographic entry see Field 03F. W73-13044 WATER AND LAND RESOURCES IN EDEN

LOSS OF INFORMATION BY DISCRETIZING HYDROLOGIC SERIES, Colorado State Univ., Fort Collins, Dept. of Civil Engineering primary bibliographic entry see Field 07A.

W73-13075 COMPUTER PROGRAMS IN HYDROLOGY,

Minnesota Univ., Minneapolis. St. Anthony Falls Hydraulic Lab. For primary bibliographic entry see Field 07C. W73-13076

'EXTENDED-RANGE' METEOROLOGICAL FORECASTS APPLIED TO MULTI-RESE-RVOIR MANAGEMENT DECISIONS, ent of the Air Force, Scott AFB, Ill. G. E. O'Connor, and R. A. Clark.

In: Proceedings (Vol. II), International Symposium on Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tucson, December 11-14, 1972. p 542-554, (1972) 7 fig. 16 ref. OWRR A-019-TEX (3).

Descriptors: "Meteorological data, "Forecasting, "Reservoirs, "Management, "Decision making, "Hydrology, "Monte Carlo methods, Simulation analysis, Monthly, Temperature, Precipitation, Constraints, Surface runoff, Crops, Consumptive use, Evaporation, Mathematical models, Systems analysis. analysis. Identifiers: *Multi-reservoir systems, Accuracy.

The uncertainty of future hydrometeorological conditions occurring within a river basin upsets the decision-making process when applied to water resources management. Presented is a model, developed in an attempt to enhance the operation of a multi-reservoir system; it utilizes 30-day meteorological forecasts of temperature and precipitation issued every 15 days by the National Weather Service, and is called MOHRS-Monthly Operational Hydrometeorological Simulting and the service of tional Weather Service, and is called MOHRS-Monthly Operational Hydrometeorological Simulator. The first application of the forecast assumes that the 30-day meteorological forecasts are 'per-fect.' Forecast categories of precipitation and tem-perature provide physical constraints upon quan-titative values synthesized by Monte Carlo simula-tion techniques. An objective analysis scheme reproduces observed spatial patterns well and facilitates computations of surface runoff, reservoir evaporation, and crop consumptive-use. A second application uses information on the accura-cy of the forecasts versus observed weather for the 24 forecast periods per year. Results show that the forecasts provided hydrometeorological infor-mation which verified better than chance. Condimation which verified better than chance. Condi-tional probabilities were used to obtain an 'ex-pected value' forecast of temperature and precipitation for each station. In general, this means of establishing knowledge of future condi-tions of evaporation and consumptive-use has worked well. (See also W73-13134) (Bell-Cornell) W73-13139

BAYESIAN HYDROLOGIC MODEL BUILDING, Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.

I. Rodriguez-Iturbe, J. Valdes, R. Lenton, and D. Valencia.

In: Proceedings (Vol. II), International Sym um on Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tuc-son, December 11-14, 1972. p 631-645, (1972). 2

Descriptors: "Parametric hydrology, "Estimating, "Mathematical models, "Stochastic processes, "Methodology, Streamflow, Synthesis, Decision making, Probability, Planning, Nature, Systems making, Probabi analysis, *Risks.

Identifiers: *Bayesian techniques, *Model building, Errors, Loss function, Autoregressive

In order to build water resource management and operation models, a clear understanding must be gained of the stochastic nature of hydrologic processes and the interaction between those processes and the various control alternatives. Future systems will most likely require oberating policies to be devised and these policies will require hydrologic forecasts to be made on the values of both the mean and the extreme values of the variable at hand. The problems of estimating hydrologic parameters as a problem of decision analysis is discussed. The main uncertainties involved in hydrologic model building are examined from a Bayesian point of view. Special attention is given to the selection of the model itself and the estimation of its parameters. A first-order autoregressive model is examined in detail because of its frequent use in hydrologic simulation. It is believed that

Group 2A-General

Bayesian methods allow the engineer to include economic considerations by formally providing a loss function which specifies the seriousness of the errors in selecting acts, and by assigning prior probabilities to states of nature either on an objective or subjective basis. Furthermore, Bayesian techniques allow engineers to incorporate judgment and experience plus other types of regional information which should not be neglected in parametric hydrology estimation. (See also W73-13134) (Bell-Cornell)

INFORMATION CONTENT OF THE REGIONAL MEAN, Pa. Dept. of Civil Engineering. J. D. Salas-La Cruz, and P. Guerrero. In: Proceedings (Vol. II), International Symposium on Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tucson, December 11-14, 1972. p 646-660, (1972). 6 fig, 3 tab, 7 ref.

Descriptors: Water resources development, *Available water, *Estimating, Measurement, Hydrology, Mathematical models, Gaging stations, Regions, Statistical models, Identifiers: *Sensitivity analysis.

Water resources development requires among other things the knowledge of the water available in the area of interest. This is usually determined by hydrological measurements at various sites which give an estimate of the water available in the area. This estimate is generally expressed in the form of statistical characteristics such as the mean and the variance. The relative information content, of the mean of a hydrological variable, representative of a given region, is defined. A general formula for the information content I is given. Sensitivity analysis is shown to be sensitive to the parameters of the model describing the series. (See also W73-13134) (Bell-Cornell)

WATER RESOURCES OF BROWARD COUNTY, FLORIDA,

Geological Survey, Tallahassee, Fla. C. B. Sherwood, H. J. McCoy, and C. F. Galliher. Geological Survey Open-file report (73007), 1973. 197 p., 64 fig, 7 tab, 32 ref.

Descriptors: *Water resources development, *Groundwater resources, *Surface waters, *Water quality, *Florida, Hydrologic data, Basic data collections, Aquifer characteristics, Water wells, Water yield, Transmissivity, Well data, Water pollution sources, Urbanization, Saline water intrusion, Water supply, Water utilization. Identifiers: *Broward County (Fla).

Broward County, Florida, has large potential supplies of freshwater because of its approximately 60-inch annual rainfall and its massive manmade surface-water management system integrated with the highly permeable Biscayne aquifer. However, he rapid urbanization of the area has been accompanied by major natural and manmade water problems. Natural problems of flood and drought are caused by extreme variations in rainfall that range from as much as 20 inches per day during the rainy season to little or none for extended periods in the dry season. Manmade water problems include: seawater intrusion that resulted from overdrainage of the area; obtaining adequate water supplies for the mushrooming population; and pollution caused by the disposal of increasing quantities of wastes. The unconfined Biscayne aquifer is the source of all fresh groundwater in Broward County. Wells that tap the thick limestone in the deep part (100 or more feet) of the aquifer near the coast yield more than 1,000 gpm. The transmissivity of the aquifer ranges from 0.4 mgd per foot in the northern part of the county to 2.5 mgd per foot near the southern part. The quality of the ground-

water is generally within the standards for potable water. (Woodard-USGS) W73-13209

APPLICATION OF A SIMPLE HYDROLOGIC MODEL FOR RAINFALL-RUNOFF RELATIONS OF THE DALITON WATERSHED, Technion - Israel Inst. of Tech., Haifa. Dept. of Civil Engineering.
M. H. Diskin, N. Buras, and S. Zamir.
Water Resources Research, Vol 9, No 4, p 927-936, August 1973, 7 fig. 3 tab, 5 ref.

Descriptors: *Rainfall-runoff relationships, *Small watersheds, *Simulation analysis, Model studies, Reservoirs, Runoff forecasting. Identifiers: *Israel (Dalton Plateau).

The problem of determining the best operating policy for a small storage reservoir or pond was solved by means of a simulation model based on a simple conceptual hydrologic model developed for rainfall-runoff relations for the watershed contributing to the pond. The hydrologic model is represented by a single element described by one parameter and having only one state variable. The simple model was found to give an adequate representation of the watershed for the particular problem for which it was used. (Knapp-USGS)

UPPER MISSISSIPPI RIVER COMPREHENSIVE BASIN STUDY, APPENDIX C--CLIMATOLOGY AND METEOROLOGY. Army Engineer District, St. Louis, Mo. For primary bibliographic entry see Field 06B.

A SURVEY OF THE WATER RESOURCES OF ST. THOMAS, VIRGIN ISLANDS, Geological Survey of Puerto Rico, San Juan. D. G. Jordan, and O. J. Cosner. Geological Survey Caribbean District open-file report. 1973. 5 b. 35 fig. 9 tab. 16 ref.

Descriptors: "Water resources, "Surface waters, "Groundwater resources, "Potential water supply, "Virgin Islands, Water quality, Hydrologic data, Streamflow, Runoff, Water yield, Aquifer characteristics, Water wells, Water supply, Water resources development, Water utilization, Geology, Climates, Topography, Rainfall, Groundwater recharge.

Identifiers: "St. Thomas (V D.

St. Thomas, with an area of 32 square miles, is the second largest of the Virgin Islands of the United States. The island is mountainous, and slopes commonly exceed 35 degrees along a central ridge 800 to 1,200 feet high running the length of the island. Water in Charlotte Amalie, the capital, is supplied by seawater desalting and water barged from Puerto Rico and is augmented by hillside rain catchments and individual roof catchments. Rainwater augmented by water hauling and a few wells is the source of water for the rural areas. Streamflow is meager--2% to 8% of the annual rainfall-and is predominantly storm runoff. Test drilling own that water can be obtained from fractured volcanic rocks in nearly all parts of the island. Fully developed, the surface water and groundwater resources of the island could yield 1.3 million gallons of water per day. Groundwater is slightly saline, commonly containing more than 1,000 milligrams per liter dissolved solids. Surface water is similar in mineral content to groundwater during base flow. (Woodard-USGS)

2B. Precipitation

EVALUATION OF TECHNIQUES FOR DETER-MINING AVERAGE PRECIPITATION IN SEMIARID VALLEYS OF IDAHO, Idaho Univ., Moscow. Dept. of Civil Engineering. D. L. Curtis. M Sc Thesis, March 1973, 104 p, 12 fig, 15 tab, 6 append. OWRR-A-034-IDA (1).

Descriptors: "Precipitation (Atmospheric), "Precipitation gages, "Rainfall disposition, 'Isohyets, "Idaho, Watersheds (Basins), Data collections, Methodology, Mathematical studies, Equations, Regression analysis, Forecasting, Mapping.

Identifiers: "Reynolds Creek watershed (Idaho), Precipitation distribution.

The Raft River basin in south-central Idaho and the Reynolds Creek Experimental Watershed in southwest Idaho were studied to determine precipitation distribution in an attempt to develop better isohyetal maps for semiarid mountain valleys. Due to gage malfunctions in the Raft River network, only the data collected by the Agricultural Research Service on Reynolds Creek was analyzed. Two methods were used to determine precipitation distribution. The computer isohyetal method worked well on Reynolds Creek but should be used only where a dense gage network is available. The Thiessen method was preferred in areas where gages are spread out. The Thiessen method was preferred in areas where gages are spread out. The Thiessen method was preferred in areas where gages are spread out. The Thiessen method was preferred in areas where gages are spread out. The Thiessen method was preferred in areas where gages are spread out. The Thiessen method was preferred in areas where gages are spread out. The Thiessen method was preferred in areas where gages are spread out. The Thiessen precipitation or the Reynolds Creek Experimental Watershed. Results indicated that no fewer than 20 gages should be used to obtain a good estimate of average precipitation. (Woodard-USGS)

THE EFFECTS OF SEVERAL WEATHER DISTURBANCES ON THE SEICHES IN LAKE TRAVIS, TEXAS,
Texas Univ., Austin. Applied Research Labs.
For primary bibliographic entry see Field 02H.
W73-13060

CLIMATIC UNCERTAINTY EFFECTS ON MANAGEMENT AND DESIGN OF RESERVOIR-IRRIGATION SYSTEMS, Montana State Univ., Bozeman. Dept. of Economics and Agricultural Economics. For primary bibliographic entry see Field 03F. W73.13137.

'EXTENDED-RANGE' METEOROLOGICAL FORECASTS APPLIED TO MULTI-RESE-RVOIR MANAGEMENT DECISIONS, Department of the Air Force, Scott AFB, Ill. For primary bibliographic entry see Field 02A. W73-13139

UNCERTAINTY IN THE RETURN PERIOD OF MAXIMUM EVENTS: A BAYESIAN APPROACH,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
D. Davis, L. Duckstein, C. Kisiel, and M. Fogel. In: Proceedings (Vol. II), International Symposium on Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tucson, December 11-14, 1972, p 853-862, (1972). 2 fig, 1 tab, 16 ref.

Descriptors: "Hydrologic data, "Rainfall, "Simulation analysis, Precipitation, Summer, Poisson ratio, Computer programs, Probability, Mathematicai models, Systems analysis, Methodology, Analytical techniques, "Risks.

Identifiers: *Bayesian methods.

In previous work by the co-authors, it was found that the return period of maximum point rainfall could be derived from the following event-based process valid for the summer precipitation season:

(a) The number of events per season is Poisson distributed; (b) the amount of point rainfall per event may be exponentially distributed; and (c) the above two random variables are independent. The objective of this paper is (1) to obtain a correct distribution function of the return period when uncertainty arises in the parameters of the Poisson and exponential distributions and (2) to obtain the probability density function of the event corresponding to a given return period and that of the probability density function of the event corresponding to a given return period and that of the return period corresponding to a given event stemming from the same uncertainty. The methodology employs conjugate distribution for the Poisson and exponential distributions to permit direct computation of posterior distributions of rainfall amounts given point rainfall data. Computer simulation shows that errors in estimated return periods lead to underdesign even with 20 years of data (for the example used in this analysis). Extensions of the methods are possible to encompass effects of uncertainties in rainfall data samples on runoff estimates and associated economic factors. (See also W73-13134) (Bell-Cornell) nell) W73-13158

METEOROLOGICAL CONDITIONS IN THE ABRAMOV GLACIER BASIN (METEOROLOGICHESKIYE USLOVIYA BASEYNA LEDNIKA ABRAMOVA), Sredneziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR). For primar W73-13351 ary bibliographic entry see Field 02C.

DEW: AN ADDITION TO THE HYDROLOGIC BALANCE OF DOUGLAS FIR, Washington Univ., Seattle. Coll. of Forest Washington Resources. For primary bibliographic entry see Field 02I. W73-13366

CLOUDINESS AS A GLOBAL CLIMATIC FEEDBACK MECHANISM: THE EFFECTS ON THE RADIATION BALANCE AND SURFACE TEMPERATURE OF VARIATIONS IN CLOUDI-NESS, National Center for Atmospheric Research,

Boulder, Colo. S. H. Schneider.

Journal of the Atmospheric Sciences, Vol 29, No 8, p. 1413-1422, November 1972. 4 fig, 3 tab, 23 ref.

Descriptors: "Temperature, "Cloud cover, "Energy, "Solar radiation, Atmospheric physics, Cloud physics, Air temperature, Radiation, Clouds, Weather, Environmental effects, Infrared radiation, Model studies, Mathematical models, Climateleles

The effect of changes in cloudiness on the radia-tion balance was analyzed, using a simple at-mospheric model in which cloud tops are regarded as a reflecting layer for solar radiation and as a blackbody radiator for the infrared atmospheric radiation. Calculations include the effect of varia-tions in cloud top height. Local departures from the global-average results have been computed as a function of latitude. Global radiation balance cala function of latitude. Global radiation balance cal-culations show that an increase in the amount of low and middle level cloud cover decreases the surface temperature. This result for the global-average case does not hold near polar regions, where the albedo of the cloudy areas can be com-parable to (or even smaller than) the albedo of the snow-covered cloudless areas, and where, espe-cially in the winter season, the amount of incoming solar radiation at high latitudes is much less than the global-average value of insolation. The exact latitude at which surface cooling changes to surface warming from a given increase in cloud cover depends critically on local values of the cloud albedo of the cloudless areas that are used in calculation. An increase in effective cloud top height increases surface temperature at all latitudes. (Jerome-Vanderbilt)

RADIOACTIVE FALLOUT IN RAIN AT MEL-BOURNE, 1988 THROUGH 1970, Commonwealth Scientific and Industrial Research Organization, Appendale (Australia). Div. of Atorganization, Appendiare (Austrana). Div. of mospheric Physics. For primary bibliographic entry see Field 05B. W73-13585

2C. Snow, Ice, and Frost

A REACTIVE SILICATE BUDGET FOR THE ARCTIC OCEAN, Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 02K.
W73-13061

ECOLOGICAL EFFECTS OF SNOWMOBILES, Carleton Univ., Ottawa (Ontario). Dept. of Biology. For primary bibliographic entry see Field 04C. W73-13113

TAXONOMIC GUIDES TO ARCTIC ZOOPLANKTON (VI): APPENDICULARIANS OF THE CENTRAL ARCTIC, MYSIDS OF THE ARCTIC OCEAN AND CONFLUENT SEAS, FIELD GUIDE TO ARCTIC ZOOPLANKTONIC CRUSTACEANS OSTRACODS OF THE CENTRAL ARCTIC ZOOPLANKTONIC ZOOPLA CRUSTACEANS OSTRACODS OF THE CENTRAL ARCTIC,
University of Southern California, Los Angeles.
Dept. of Biological Sciences.
For primary bibliographic entry see Field 05A.
W73-13300

GLACIOLOGY OF SOVIET CENTRAL ASIA (GLYATSIOLOGIYA SREDNEY AZII). Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR)

Sredneaziatskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 65 (80), Leningrad, 1972. 155 p.

Descriptors: "Glaciology, "Glaciers, Mountains, Snowpacks, Ice, Firn, Ablation, Glacial drift, Glacial sediments, Sediment yield, Suspended load, Discharge (Water), Heat balance, Meteorological data, Palynology, Radar, Aerial photography, Satellites (Artificial), Snow surveys, International Hydrological Decade. Identifiers: USSR, "Soviet Central Asia, "Abramov Glacier, Glacier mass budget.

Meteorological conditions, heat balance, mass budget, and glacier-runoff characteristics were in-vestigated on the Abramov glacier in southwestern Kirgizia after the framework of the International Hydrological Decade. Results are presented of pa-lynological observations and radar measurements of ice thickness, and problems relating to use of satellite data in the study of snow cover are described. (See W73-13351 thru W73-13359) (Josefson-USGS)

METEOROLOGICAL CONDITIONS IN THE ABRAMOV GLACIER BASIN (METEOROLOGICHESKIYE USLOVIYA BAS-

SEYNA LEDNIKA ABRAMOVA), Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR). Z. A. Geras ova, Yu. N. Yemel'yanov, and V. K.

Nozdryukhin. In: Głyatsiologiya Sredney Azii; Sredneaziatskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 65 (80), p 3-35, Leningrad, 1972. 7 fig. 21 tab. 8 ref.

*Glaciers, Descriptors: *Meteorolog Descriptors: "Glaciers, "Meteorology, "Meteorological data, Synoptic analysis, Air temperature, Humidity, Wind velocity, Precipitation (Atmospheric), Clouds. Identifiers: USSR, "Abramov Glacier (USSR).

Meteorological conditions were investigated at 3 observation stations on the Abramov Glacier in southwestern Kirgizia in 1967-70. The meteorological elements described include air temperature, humidity, wind velocity (direction and speed), precipitation, and cloudiness (type and amount of clouds). (See also W73-13350) (Josefson-USGS)

HEAT BALANCE OF SURFACES OF THE ABRAMOV GLACIER AND LATERAL MORAINE IN SUMMER (TEPLOVOY BALANS POVERKINOSTEY LEDNIKA ABRAMOVA I BEREGOVOY MORENY V LETNIY PERIOD), Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR). Z. A. Gerasimova

Z. A. Gerasinova. In: Glyatsiologiya Sredney Azii; Sredneaziatskiy Nauchno-Issledovateľ skiy Gidrometeorologicheskiy Institut Trudy, No 65 (80), p 36-44, Leningrad, 1972. 3 fig. 5 tab, 11 ref.

Descriptors: *Glaciers, *Glacial drift, *Surfaces, *Heat balance, *Summer, Heat flow, Temperature, Evaporation, Radiation, Meteorology, Ice, Curves, Equations.
Identifiers: USSR, *Abramov Glacier (USSR).

Radiation characteristics of ice and moraine sur-faces were investigated in heat-balance studies on the Abramov Glacier in southwestern Kirgizia in July-August 1969. Large differences were ob-served in the values of all items in the heat balance served in the values of all items in the heat balance of glacier and moraine surfaces. Radiation balance of the glacier for clear days in July averaged 303.5 cal/sq cm and that of the moraine was 368.4 cal/sq cm. A large portion of the glacier's total heat income (71.4% in July and 79.6% in August) is the radiation balance. For bare ice, heat losses to mething are considerably higher than heat losses to evaporation. For moraine, heat losses to evaporation predominate over other values in the total heat expenditure. (See also W73-13350) (Josefson-USGS) W73-13352

MASS BUDGET OF THE ABRAMOV GLACIER (BYUDZHET MASSY LEDNIKA ABRAMOVA), Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR) Yu. N. Yemel'yanov, V. K. Nozdryukhin, and N.

Yu. Fetrov.
In: Glyatsiologiya Sredney Azii; Sredneaziatskiy
Nauchno-Issledovateľ skiy
Gidrometeorologicheskiy Institut Trudy, No 65
(80), p 45-51, Leningrad, 1972. 2 fig, 3 tab, 2 ref.

Descriptors: *Glaciers, Snowpacks, Ice, Firn, Ablation, Water equivalent, Snow surveys, Al-titude, Elevation, Curves. Identifiers: USSR, *Abramov Glacier (USSR),

Accumulation and ablation of snow and ice on the Abramov Glacier in southwestern Kirgizia were

Group 2C-Snow, Ice, and Frost

investigated in snow surveying performed in 1967-70. Glacier mass budget during the period was negative, as evidenced by a loss of mass equal to 200 m and by a drop in surface level of the glacier tongue averaging 6 m. Changes in glacier mass budget with altitude for the 1969-70 budget year are graphed, and tables show ablation of snow and ice at different elevations in 1970, as well as accu-mulation and ablation of snow and ice (in mm of water equivalent) at an elevation of 3,800 m in 1967-70. (See also W73-13350) (Josefson-USGS) W73-13350

SUSPENDED-SEDIMENT YIELD FROM THE ABRAMOV GLACIER BASIN (STOK VZ-VESHENNYKH NANOSOV S BASSEYNA LED-NIKA ABRAMOVA), Sredneaziatskii

Nauchno-Issledovatelskii Gidrometeorologicheskii Institut,

A. A. Akbarov, and V. A. Neupokoyev.

In: Glyatsiologiya Sredney Azii; Sredneaziatskiy Nauchno-Issledovatel'skiy

Gidrometeorologicheskiy Institut Trudy, No 65 (80), p 60-72, Leningrad, 1972. 3 fig, 2 tab, 21 ref.

Descriptors: *Glacial sediments, *Sediment yield, "Sediment vield, transport, "Suspended load, Suspended solids, Suspension, Turbidity, Discharge (Water), Seasonal, Curves. Identifiers: USSR, "Abramov Glacier (USSR), *Koksu River (USSR).

ent of sediment transported in susp by the Koksu River was investigated in 1968-70 after the framework of the International Hydrological Decade. Suspended load of the river 0.4 km below the terminus of the Abramov Glacier was 41,630 metric tons in 1968, 28,690 metric tons in 1969, and 81,480 metric tons in 1970. Water discharge of the river 69.4, 58.8, and 80.7 million cu m, respectively. (See also W73-13350) (Josefson-USGS) W73-13355

RADAR SOUNDING OF THE ABRAMOV GLA-CIER (RADIOLOKATSIONNOYE DIROVANIYE LEDNIKA ABRAMOVA).

Gidrometeorologicheskii Institut (USSR).

A. K. Ryumin.

A. R. Kyuma. In: Glyatsiologiya Sredney Azii; Sredneaziatskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 65 (80), p73-83, Leningrad, 1972. 4 fig 1 tab, 5 ref.

Descriptors: *Glaciers, *Analytical techniques, *Measurement, *Sounding, *Radar, Antennas, Instrumentation, Profiles. Identifiers: USSR, *Abramov Glacier (USSR).

Results are presented of radar measurements of ice thickness of the Abramov Glacier in southwestern Kirgizia in the summer of 1970. Soundings were made with standard radar altimeters operating at a frequency of 440 mc. Ice thickness of the glacier was measured at 119 points over an area of 15 km. Maximum thickness of the ice was 170 m. Methods of investigation and possi-bilities of using radar as a sounding technique are discussed. (See also W73-13350) (Josefson-USGS) W73-13356

AVERAGE ALBEDO VALUES OF GLACIERS DURING THE ABLATION SEASON (O SREDNIKH ZNACHENIYAKH AL'BEDO LED-SREDNIKH ZNACHEMITARI NIKOV V PERIOD ABLYATSII), Sredneaziatskii Nauchno-Issledovatelskii

Gidrometeorologicheskii Institut, (USSR). V. G. Konovalov.

In: Glyatsiologiya Sredney Azii; Sredneaziatskiy Nauchno-Issledovatel'skiy

Gidrometeorologicheskiy Institut Trudy, No 65 (80), p 111-122, Leningrad, 1972. 1 fig. 5 tab, 11

Descriptors: "Glaciers, "Ablation, "Albedo, Snowpacks, Ice, Firn, Surfaces, Cloud cover, Statistical methods, Estimating, Measurement, Variability, Equations. Identifiers: USSR.

Data are presented on field measurements of al-Data are presented on field measurements of al-bedo (in percent) on mountain glaciers of the world during the ablation season. Average albedo values are obtained for seven different types of glacier surfaces, and estimates are made of the re-liability of these values. Results of a statistical analysis of albedo measurements on the Raygorodskiy Glacier in 1968 and on the Ayutor-2 Glacier in 1969 are tabulated, and quantitative characteristics are derived for the effects of clou-dy conditions on reflective properties of a elacier dy conditions on reflective properties of a glacier surface. (See also W73-13350) (Josefson-USGS)

SOME CHARACTERISTICS OF MODERN GLACIERS IN THE NARYN RIVER BASIN (NEKOTORYYE CHERTY SOVREMENNOGO OLEDENENIYA BASSEYNA R. NARYNA), Sredneaziatskii Nauchno-Issledovatelskii Gidgometeropoiciphasii Institut Takhkari

Gidrometeorologicheskii Institut, Tashkent (USSR)

L. G. Cherkasov, V. P. Fateyev, and Yu. P.

Baroat. In: Glyatsiologiya Sredney Azii; Sredneaziatskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 65 (80), p 123-130, Leningrad, 1972. 2 tab, 8 ref.

Descriptors: *Glaciology, *Glaciers, *River basins, Mountains, Streams, Size, Shape. Identifiers: USSR, *Naryn River (USSR).

New data on modern glaciers in the Naryn River basin in Kirgizia are based on on-site investiga-tions in 1963-69, recent large-scale topographic maps, and aerial photographic surveys. In the river basin there are 2,074 glaciers, covering an area of 1,357.8 sq km. Glaciers are divided into three categories on the basis of size: (1) large glaciers (3-5 sq km or more), covering 36% of the glacier sq. 5 sq km or more), covering 36% of the glacier area of the basis; (2) medium-size glaciers (1-3 sq km), occupying 31% of the glacier area; and (3) small glaciers (smaller than 1.0 sq km). covering oneglaciers (smaller than 1.0 sq km), covering one-third of the glacier area. Occurring as independent and isolated sheets, glaciers are classified by shape as hanging, corrie, and valley glaciers. The firm line varies in height from 3,520 m in the west to 4,400 m in the east. (See also W73-13350) (Josef-son-USGS) W73-13358 ers (smaller than 1.0 sq km), covering one-

DESCRIPTION OF GLACIER RECESSION IN THE AMU-DAR'YA RIVER BASIN FROM AERIAL PHOTOGRAPHIC SURVEY DATA FOR 1946-66 (KHARAKTERISTIKA OTSTU-PANIYA LEDNIKOV BASSEYNA R. AMUDAR'I PO MATERIALAM AEROPOTOS'YEMKI 1946-1966 GG), Sredneaziatskii Nauchno-Issledovatelskii

Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut Taakka-(USSR). V. I. Ratsek.

V. I. Katsch. In: Glyatsiologiya Sredney Azii; Sredneaziatskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 65 (80), p 131-137, Leningrad, 1972. 1 fig, 4 tab, 10

Descriptors: *Glaciology, *Glaciers, *River basins, *Aerial photography, Mountains, Icc. Identifiers: USSR, *Amu-Dar'ya River (USSR), *Glacier recession.

Glacier evolution was investigated in aerial photo-graphic surveys performed in the glacierized zone

of the Pamir-Alay mountain chain in 1946-66. Eight percent or 580 sq km of the glacier area in the Soviet part of the Amu-Dar'ya basin is cur-rently in recession, which agrees with data for Central Tien Shan in the Akshiyrak basin, where about 10% of the glacier area is dead ice. Between 1946 and 1966 the area of the Lenin and Yazgulem-1946 and 1966 the area of the Lenin and Yazgulem-dar Glaciers was reduced 0.8%. Assuming climatic conditions remain the same, 8% of the glacier area in the Amu-Dar'ya basin, equaling 11,700 sq km or 930 cu km of ice, may disappear in 200 years. The problem of glacier recession must be considered in terms of ice-melt and runoff fluctuations in preparing plans for the utilization of water and land resources in Soviet Central Asia. (See also W73-13350) (Josefson-USGS) W73-13350) W73-13359

MONITORING SNOW WATER EQUIVALENT BY USING NATURAL SOIL RADIOACTIVITY, National Weather Service, Silver Spring, Md. V.C. Bissell, and E. L. Peck. Water Resources Research, Vol 9, No 4, p 885-890, August 1973. 5 fig, 6 ref.

Descriptors: *Snow cover, *Snowpacks, *Snow surveys, *Water equivalent, *Nuclear moisture meters, *Vermont, Radioactivity techniques, Identifiers: Sleepers River watershed (Vt). Gamma rays. experimental

The attenuation by snow cover of natural gamma radiation emitted from the soil serves as an excellent index to the water equivalent of the snow cover. A small portable gamma ray detector was installed on a boom about 2 meters above the ground at Sleepers River watershed near Danville, Vermont. Comparison of gamma ray count with snow measurements indicates that the small unshielded gage could be used to measure snow water equivalent with a standard error of 1.5 cm. A jor source of error was the deposition of radioactive aerosols on the snow surface by precipitation. The deviation of gamma ray count rates due to precipitation events is short-lived, and a simple editing procedure on the count rate time trace reduced the snow season standard error to 1.1 cm. The edited count rate yielded 6% error in to 4% in the 25- to 40-cm water equivalent range, decreasing to 4% in the 25- to 40-cm water equivalent range. This measurement method could be extremely valuable in providing unmanned measurement of snow water equivalents at remote locations. (K-napp-USGS)
W73-13382

2D. Evaporation and Transpiration

A STOCHASTIC MODEL FOR THE OCCUR-RENCE OF MOISTURE IN VADOSE MEDIA, Clemson Univ., S.C. For primary bibliographic entry see Field 02G. W73-13074

PHYSIOLOGY OF DAILY TRANSPIRATION RHYTHM IN WOODY PLANTS,

T. M. Khashes. 1. M. Alasiles. Ekologiya. Vol 2, No 6, p 28-32, 1971. Illus. Identifiers: Acacia, Ash, Carbohydrates, Daily, Oak, Plant physiology, Poplar, Potassium, Sophora, *Transpiration, Willow, *Woody plants.

arative studies were made of different forest ins from 1967-69 to relate differences in daily iration rhythm to the physiological condition transpiration raytim to the physiological condition of the leaves. The objects were 17-18 yr old poplar, willow, acacia, sophora and oak trees in shelter-belts and along irrigation canals. Transpiration, ash, K and carbohydrate contents, and the content of total, free and bound water were determined. A correlation between the midday fall in transpiration intensity and daily dynamics of free and bound water, assimilation products and mineral composition of the leaves was shown. This physiological regulatory mechanism decreased transpiration loss and guaranteed the normal course of biochemical processes under changing growing conditions.—Copyright 1973, Biological Abstracts, Inc. W73-13095

INHERITANCE AND PHYSIOLOGICAL EF-FECTS OF STOMATAL PREQUENCY IN BAR-

FECTIS OF STOMMENT OF STOMME

POTENTIAL EVAPORATION FROM PASTURE

AND POTATORS AT ASPENDALE,
Commonwealth Scientific and Industrial Research
Organization, Aspendale (Australia). Div. of Atmospheric Physics.
A. C. Dilley, and W. Shepherd.
Agric Meteorol. Vol 10, No 4/5, p 283-300, 1972. Il-

Identifiers: *Australia (Aspendale), *Evaporation rates, Pasture, *Potatoes.

Evaporation rates associated with well-watered pasture, potato crops and bare soil at Aspendale, Australia, and environmental and biological factors which influence them, were examined in analyses based on a formula of the combination type. Ratios of potato and soil to pasture evaporation were 1.27 and 1.17, respectively. A decrease of pasture evaporation relative to pan evaporation of 19% over a 9-yr period is attributed to progresive changes of pasture composition. Increased medium-scale advection to the experimental area accompanied changes in the surroundings occurring over the period. Linear empirical relationships were derived relating measured evaporation from the vegetated and bare soil surfaces to that from a Class A water pan and to values computed by means of the combination formula. The correlation coefficients for grass and soil evaporation means of the combination formula. The correlation coefficients for grass and soil evaporation were >0.97. Those for potatoes were 0.94 and 0.90, for pan and computed evaporation, respectively. The correlations confirm the suitability of both the combination method and the Class A pan for estimating evaporation under conditions of generous watering. The lower correlations with potatoes are attributed to the more variable nature of the surface involved and to the greater sensitivity of potatoes to minor restriction of water supply.—Copyright 1973, Biological Abstracts, Inc.

W73-13296 W73-13296

NETWORK DENSITY OF TEMPERATURE PROFILE STATIONS AND ITS INFLUENCE ON THE ACCURACY OF LAKE EVAPORATION CALCULATION.

THE ACCURACY OF LAKE EVAPORATION CALCULATIONS, Oklahoma State Univ., Stillwater. Dept. of Agricultural Engineering. F. R. Crow, and S. D. Hottman. Water Resources Research, Vol 9, No 4, p 895-899, August 1973. 3 fig, 2 tab, 4 ref. USBR Contract 14-06-D-5629.

Descriptors: "Evaporation, "Lakes, "Data collections, Oklahoma, Reservoir evaporation, Meteorology, Water temperature, Gaging stations, Statistical methods, Network design. Identifiers: Lake Hefner (Okla).

The accuracy of lake evaporation determined by the energy budget method depends on the preci-sion of measurement of the total thermal energy content of the lake, which in turn is related to the number and distribution of the temperature-mea-suring points. The number of sampling points to be used should be such that the error in the stored thermal energy is of the same magnitude as the

error in the other terms in the energy budget. This problem was studied at Lake Hefner, a 2600-acre off-stream reservoir at Oklahoma City, Oklahoma. Ten evaporation periods of 1-week duration each were included. Stored thermal energy was calculated on the basis of temperature profiles taken at 5-foot depth increments at 19 locations uniformly spaced over the lake. Evaporation was determined by the energy budget method using stored thermal energy calculated on the basis of 1, 5, 11, or 19 temperature profile stations. Analysis showed the optimum number of stations to be 5, or one station per 520 acres. Using only one station resulted in an evaporation error of 8.2% at the deepest point of the lake. Increasing the number of stations from 5 to 19 resulted in an increase of accuracy of evaporation measurement of only 1%. (Knapp-USGS)
W73-13365 W73-13365

STUDIES ON THE TEMPERATURE AND WATER BALANCE OF CHOSEN PLANT SPECIES OF THE DRY AREA OF SANTA MARTA (COLOMBIA), (IN SPANISH), Universidad Nacional de Colombia, Bogota. R. Schnetter.

R. Schnetter. Beitr Biol Pflanz. Vol 47, No 2, p 155-213. 1971. Il-lus. English summary. Identifiers: *Colombia (Santa Marta), Cucumis-Anguria, Heat resistance (Plants), Prosopis-Juliflora, Seasonality, Species, Stylosanthes-Hamata, "Temperature balance, "Transpiration, Tribulus-Cistoides, "Water balance.

Ecological studies were carried out at 2 observation sites (cactus thorn scrub, clearing of a semi-deciduous tropical lowland forest) in the xerophytic region of Santa Marta, Columbia. The temperatures, transpiration, water contents, and heat resistances of leaves from several plant species were studied. During the wet season, and on the clearing of the semideciduous lowland forest with its more favorable water conditions also during the dry season, the leaf temperatures generally reached about 35C at noon; only rarely temperatures higher than 40C were observed. The leaf temperatures of smaller plants (Cucumis anguria, Stylosanthes hamata, Tribulus cistoides) often were lower than the temperature of the air in their Stylosanthes hamata, Tribulus cistoides) often were lower than the temperature of the air in their environment near the ground (up to 5C). Lower water contents of leaves caused by the water stress in the dry season were correlated with reduced transpiration rates and elevated transpiration retestances (Prosopis juliflora and Tribulus in the cactus thorn scrub). Under these conditions, the leaves of Tribulus reached temperatures as high as 53C causing heat damage. Some examples for the energy exchange between leaves and environment are discussed.—Copyright 1973, Biological Abstracts, Inc.

W73-13385

ON THE SIGNIFICANCE OF ANTITRANS-PIRANTS FOR TROPICAL CULTIVATED PLANTS, (IN GERMAN), Giessen Univ. (West Germany). Lehrstuhl Botank

(II).
L. Steubing, R. Herrmann, and R. Michler.
Mitt Inst Colombo-Aleman Invest Cien Punta De
Betin, 5, p 19-29, 1971. Illus. English summary.
Identifiers: "Antitranspirants, Cresopinol, Cutivated, Leaf, Manihot-Esculenta, Octodecanol,
Phaseolus-Vulgaris, Temperature, Toxicity,
Transpirants, Trifolium-Repens, Triton, Tropical
plants, Water transport (Plants), "Foliar sprays.

The influence of different foliar sprays as antitranspirants (0.1-0.5% Octodecanol, 15% Triton, 10% Cresopinol, 1% oil emulsion) was tested on Trifolium repens, Phaseolus vulgaris and Manihot esculents under field and greenhouse conditions. The water loss of these plants decreased considerably after application. A remarkable reducion of the speed of water transport in the stem was measured as well as decline of both transpira-

tion and water deficit of the leaves. Decreases of tion and water deficit of the leaves. Decreases of leaf temperatures and porometer values were ob-served. Octodecanol was most efficient, follwed by Triton 500. A spray of oil caused infiltration and toxic effects; the same influences have been noted after application of Cresopinol, but somewhate less frequently.—Copyright 1973, Biological abstracts, Inc. W73-13394

DIFFERENTIAL STOMATAL RESPONSE BETWEEN C3 AND C4 SPECIES TO AT-MOSPHERIC CO2 CONCENTRATION AND

MOSPHERIC CO2 CONCENTRATION AND LIGHT, National Inst. of Agricultural Sciences, Konosu (Japan). Dept. of Plant Physiology and Genetics. S. Akita, and D. N. Moss.
Crop Sci. Vol 12, No 6, p 789-793. 1972. Illus. Identifiers: Amaranthus-Retroflexus, Atmospheric conditions, Barley, "Carbon dioxide, Dandelion, Differential, Foxtail, Hordeum-Vulgare, Light, Maize, Pigweed, Setaria-Viridis, Species, "Stomatal response, Taraxacum-Officinale, "Transpiration, Triticum-Aestivum, Wheat, Zea-Mays.

Transpiration measurements were made on at-tached leaves of potted plants or on excised leaves tached leaves of potted plants or on excised leaves of native plants of 3 C3 species-wheat (Triticum aestivum L.), barley (Hordeum vulgare L.), and dandelion (Taraxacum officinale L.)—and 3 C4 species-maize (Zea mays L.), green foxtail (Setari viridis L.), and pigweed (Amaranthus retroflexus L.)—in different CO2 concentrations and light intensities. The experiments were begun with leaves in CO2-free air in light (0.4 cal/cm2/min, 400-700 mm) to coren the stownts. Stommts of C3 species nm) to open the stomata. Stomata of C3 species were less prone to closure than were stomata of C4 species as the light intensity was decreased or as the CO2 concentration was increased. The greater water use efficiency of C4 species may be due to water use efficiency of C4 species may be use to part to the better control of water loss because the stomata are more responsive to environmental changes than are the stomata of C3 species.— Copyright 1973, Biological Abstracts, Inc. W73-13398

DIURNAL FLUCTUATIONS IN SOIL WATER POTENTIAL, Duke Univ., Durham, N.C. Dept. of Botany. For primary bibliographic entry see Field 02G. W73-13438

CLOUDINESS AS A GLOBAL CLIMATIC FEEDBACK MECHANISM: THE EFFECTS ON THE RADIATION BALANCE AND SURFACE

TEMPERATURE OF VARIATIONS IN CLOUDI-NESS, National Center for Atmospheric Research, National Center for Atmospheric Resea Boulder, Colo. For primary bibliographic entry see Field 02B. W73-13441

EFFECT OF CLEAR CUTTING IN THE WATER REGIME OF THE PRINCIPAL FOREST TREES OF THE SEVAN SHORE, (IN RUSSIAN), For primary bibliographic entry see Field 04A. W73-13593

A DIGITAL REGISTRATION SYSTEM FOR NET PHOTOSYNTHESIS AND TRANSPIRA-TION MEASUREMENTS IN THE FIELD AND AN ASSOCIATED ANALYSIS OF ERRORS, Wuerzburg Univ. (West Germany). Botanisches Institut III.

Hastitut II. E-D. Schulze, O. L., Lange, and G. Lembke. Oecologia (Berl). Vol 10, No 2, p 151-166. 1972. II-

lus. Identifiers: Digital systems, *Errors, *Field mea-surements, *Photosynthesis, *Transpiration.

Group 2D-Evaporation and Transpiration

A digital registration system used with tempera-ture- and humidity-controlled cuvettes for net photosynthesis and transpiration measurements in the field is described. The associated errors of the measured parameters and calculated data are esti-mated. The digtalization is based on an analog registration which is of primary importance in the control of experimental conditions in the cuvettes. The digital system is connected to the analogue re gistration in series. The error associated with digitilization is 0.1% across 70% of the scale. This aguization is 0.1% across 70% of the scale. I mis error increases to 0.2% between 3 and 30% on the scale due to a minor lack of linearity. The reprodu-cibility of the digitalization is plus or minus 0.024%. The error associated with data transfer in the digitalization and the errors of the analog registration are estimated for temperature and humidity measurements (error of air and leaf temperature is plus or minus 0.1C; error of the dew point tem-perature is plus or minus 1.1C dew point). The ef-fect of these errors on the calculation of relative fity and the water vapor difference between the leaf and the air is determined using the progressive error law. At 30C and 50% relative humidity, the error in relative humidity is plus or minus 7.4%, the error for the water vapor dif-ference is plus or minus 6.6%. The dependence of these errors on temperature and humidity is these errors on temperature and humidity is shown. The instrument error of the net photosynthesis measurement is calculated to be plus or minus 4.2%. Transpiration measurements plus or minus 4.2%. Transpiration measurements have an average inaccuracy of plus or minus 8.3%. The total diffusion resistance which is calculated from values of transpiration and the water vapor difference has an average of plus or minus 10.9%. The sizable influence of errors in humidity and temperature measurements on the calculated diffusion resistance is demonstrated. The additional influence of biological errors associated with field measurements is discussed—Convicted 1973. measurements is discussed.—Copyright 1973, Biological Abstracts, Inc. W73-13597

AN EXPERIMENT DETERMINING THE TOTAL EVAPORATION FROM A FIELD OF A PLANNED IRRIGATION BLOCK OF LAND IN SOUTHERN MUGAN OF AZERBAIDZHAN SSR, (IN RUSSIAN), S. A. Kurbanov

Izv Akad Nauk Az SSR Ser Biol Nauk. p 61-67,

Identifiers: *Azerbaidzhan-SSR (Mugan), *Evaporation, Irrigation, Land use, Temperature, USSR, Planning.

Dependence E ± Alpha Eo, in which Eo stands for evaporation, and alpha is a parameter indicating effect of temperature gradients and air the effect of temperature gradients and air moisture on total evaporation, enables the calcula-tion of the course of average daily evaporation. This is possible with common analysis of water and heat balance elements with regard to biologi-cal development of plants. This method can be also used for calculating irrigation terms and norms in planning hydroeconomic objects accord-ing to available hydrometeorologic observations.— Copyright 1973, Biological Abstracts, Inc. W73-13605

A BATTERY DRIVEN MEASURING AP-PARATUS FOR THE ELECTRICAL REGISTRA-TION OF EVAPORATION OR DEWFALL, (IN GERMAN), Innsbruck Univ. (Austria). Institut Allgemeine

Botanis.
A. Cernusca, and G. Cernusca.
Centralbl Gesamte Forstwes. Vol 89, No 2, p 61-74, 1972. Illus. English summary.
Identifiers: Computers, *Dewfall, Driven, Economy, Ecosystem, Electrical measurement, *Evaporation, *Evapo

A battery driven evaporimeter was developed which was applicable to any electric registration device as strip card recorders, electric event coun ters, printers, tape punches or desk computers. With this evaporimeter synchronous registration of evaporation and other meteorological and ecophysical parameters of the environment, as well as certain ecophysiological parameters can be carried out. Thus it constitutes a basis for causal carried out. Thus it constitutes a basis for causal analytic investigations of plant water economy and productivity and for other problems in the applied biology. Construction and operation of the evaporimeter were tested estensively. The calibration factor of the evaporimeter depends not only upon the various parameters of the device but also upon the temperature. Long term measurements carried out in difficult mountainous terrain determined adaptability of the device in ecosystem analyses and stability under severe weather conditions.—Copyright 1973, Biological Abstracts, Inc. W73-13619

2E. Streamflow and Runoff

HYDROLOGIC RESPONSE OF SACHUSETTS WATERSHEDS, Massachusetts Univ., Amherst. Dept. of Civil En-For primary bibliographic entry see Field 02A. W73-13034

WATER RESOURCES DATA FOR TEXAS, 1972: PART 1, SURFACE WATER RECORDS. Geological Survey, Austin, Tex. Water Resources

For primary bibliographic entry see Field 07C. W73-13069

AN ANALYSIS OF SAMPLING-FREQUENCY ALTERNATIVES FOR FITTING A DAILY STREAM-FEMPERATURE MODEL, Geological Survey, Washington, D.C. For primary bibliographic entry see Field 04A. W73-13142

BAYESIAN HYDROLOGIC MODEL BUILDING, Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02A.
W73-13144

DEVELOPMENTS IN APPLICATIONS OF REMOTE SENSING TO HYDROLOGIC MODELING,

IBM Space Systems Center, Huntsville, Ala. R. Ambaruch, J. W. Simmons, and L. D. James. In: Proceedings (Vol. ID, International Symposium on Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tucson, December 11-14, 1972. p 661-676, (1972). 3 fig, 6 tab, 5 ref.

Descriptors: Hydrology, "Mathematical models, *Remote sensing, *Streamflow forecasting, *Ten-nessee River, *Watersheds (Basins), *Computer programs, Optimization, Simulation analysis, Feasibility, Calibration, Climatic data, Hydrologic data, Synthetic hydrology, Parametric hydrology, Identifiers: Prediction, Sensitivity analysis, Historical data.

Progress and initial results in the first major part of Progress and initial results in the first major part of a stream flow forecasting project, utilizing aircraft (and later space) derived imagery for watersheds of the Tennessee River Valley, are presented. The initial study phase, aimed at assessing the feasibili-ty of applying remote sensing data to prediction of watershed performance, is approximately 30 per-cent complete. Demonstration of feasibility will lead to a means of prediction of the hydrological lead to a means of prediction of the hydrological behavior of ungaged watersheds using remote sensed data to minimize time, effort, and cost of achieving these predictions. The watersheds chosen for calibration and simulation provide a wealth of climatological and streamflow historical data and nerial photographic and ground survey coverage. A computer program based on the Stanford Watershed Model IV and a companion parameter-optimization program are used to calibrate model parameters for the selected catchments, based on historical data. The accuracy of the models is shown by comparison of synthesized with observed streamflows. Sensitivity of the model's simulation results to variations in its model parameters has been analyzed for two watersheds. Methods of determining model parameters from physical characteristics observable or inferable from remotely acquired photographs, without the necessity of historical streamflow data, are discussed. (See also W73-13134) (Bell-Cornell) sensed data to minimize time, effort, and cost of

A NOTE ON WIND AND WAVE CONDITIONS
IN THE SOUTHERN GULF OF ST.
LAWRENCE,
McMaster Univ., Hamilton (Ontario).
For primary bibliographic entry see Field 02L.

MAGNITUDE AND FREQUENCY OF FLOODS IN SMALL DRAINAGE BASINS IN IDAHO-A DESIGN METHOD, Geological Survey, Boise, Idaho. For primary bibliographic entry see Field 04A. W73-13208

STREAMFLOW DATA USAGE IN WYOMING, Wyoming Univ., Laramie. Water Resources Research Inst. For primary bibliographic entry see Field 07C. W73-13306

CHARACTERISTICS OF THE HYDROLOGIC REGIMEN OF THE (OSOBENNOSTI GIDROLOGICHESKOGO REZHIMA R. KOKSU V 1970 G.), Sredneaziatskii Nauchno-Issledovatenoparichasii Institut Tarkkani Gidrometeorologicheskii Institut, (USSR). In: Glyatsiologiya Sredney Azii; Sredneaziatskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 65 (80), p 52-59, Leningrad, 1972. 4 fig, 2 tab, 9 ref.

Descriptors: "Hydrology, "Regimen, "Rivers, Glaciers, Discharge (Water), Runoff, Floods, Low flow, Water levels, Water temperature, Air temperature, Meteorological data, Water sampling, Chemical analysis, Curves. Identifiers: USSR, "Koksu River (USSR), Mineralization.

Characteristics of the water regimen of the Koksu River were investigated in 1970 in hydrological studies conducted 400 m below the terminus of the Abramov Glacier in southwestern Kirgizia after the framework of the International Hydrological Decade. Studies included observations of water levels measurement of flow velocities and deaths. Locauc. Studies included observations of water levels, measurement of flow velocities and depths for determination of water discharges, water sampling for chemical analysis, and observations of water temperature. (See also W73-13350) (Josefson-USGS) W73-13354

APPLICATION OF A SIMPLE HYDROLOGIC MODEL FOR RAINFALL-RUNOFF RELA-TIONS OF THE DALTON WATERSHED, Technion - Israel Inst. of Tech., Haifa. Dept. of Civil Engineering. For primary bibliographic entry see Field 02A. W73-13362

TECHNIQUE FOR IMPLICIT DYNAMIC ROUT-ING IN RIVERS WITH TRIBUTARIES, l Weather Service, Silver Spring, Md. Office of Hydrology. D. L. Fread.
Water Resources Research, Vol 9, No 4, p 918926, August 1973. 5 fig, 1 tab, 24 ref.

Descriptors: "Routing, "Streamflow forecasting, "Unsteady flow, Tributaries, Numerical analysis, Stage-discharge relations, Equations, Flood routing, Simulation analysis.
Identifiers: *Dynamic flood routing.

Prediction of transient flow in a river having a major tributary poses a problem for the stream-flow forecaster. The interaction of storage and flow forecaster. The interaction of storage and dynamic effects between the two rivers can be simulated efficiently by a mathematical model consisting of the two unsteady flow differential equations and of known stage time, discharge time, or stage-discharge relationships at the extremities of the rivers. Numerical solutions of discharge and water surface elevation are obtained from the differential equations at specified time intervals by an implicit finite difference technique. This produces successive systems of nonlinear equations that are efficiently solved by the Newton-Raphson iterative method in combination with an extrapolation procedure and a specialized direct method for solving a system of linear equations. The length of the specified time interval is tions. The length of the specified time interval is not limited by computational stability; however, accuracy constraints may limit its size. Some numerical results are presented to illustrate the interaction between a river and a tributary when they are subjected to a flood wave of long duration. (Knapp-USGS) W73-13363

USE OF CROSS CORRELATION BETWEEN HYDROLOGICAL TIME SERIES TO IMPROVE ESTIMATES OF LAG ONE AUTOREGRESSIVE

PARAMETERS, Institute of Hydrology, Wallingford (England). For primary bibliographic entry see Field 07C. W73-13364

REGULAR MEANDER PATH MODELS, Hull Univ. (England). Dept. of Geography R. I. Ferguson. Water Resources Research, Vol 9, No 4, p 1079-1086, August 1973. 6 fig, 1 tab, 14 ref.

Descriptors: *Meanders, *Mathematical studies, *Mathematical models, Alluvial channels. Identifiers: Topology.

Existing mathematical models for regular meander paths are shown to be members of a general family of differential equations in which the rate of change of curvature along the channel is an odd function of path direction and bends are symmetric. The physical assumptions of the general model and possible justifications of the particular cases are outlined. Each model is specified by one scale parameter (path or axial wavelength) and one shape parameter (maximum deviation, sinuosity, or maximum curvature). Exact analytic expressions shape parameter (maximum deviation, sinuosity, or maximum curvature). Exact analytic expressions for geometric properties of circular arcs, Fargue's spiral, Von Schelling's curve, and the sine-generated curve are presented and illustrated by dimensionless plots; the last three models are generally similar. Properties of natural meander bends show fair agreement with these three regular models, although bend size and shape vary along individual channels, possibly because of nonuniform floodplain topography and sediments. (Knapp-USGS)
W73-13370

ON THE WIND-DRIVEN CIRCULATION OF A STRATIFIED OCEAN, University of East Anglia, Norwich (England). School of Mathematics and Physics. For primary bibliographic entry see Field 05B. W73-13429

NAVIFACIAL TEMPERATURE AND SALINITY ALONG THE TRACK FROM SAMOA TO HAWAII, 1987-1965, Stevens Inst. of Technology, Hoboken, N.J. R. I. Hires, and R. B. Montgomery. Journal of Marine Research, Vol 30, No 2, p 177-

200, 1972. 10 fig, 30 ref.

Descriptors: *Ocean circulation, *Temperature, *Seasonal, *Heat flow, *Salinity, Oceanography, Ocean currents, Pacific Ocean, Thermocline, Thermodynamics, Isotherms, Sea water, Tropical regions, Data collections, Evaluation, Geophysics. Identifiers: Transequatorial voyages, Pago Pago,

Data were collected by ships on the temperature and salinity of intake water from measurements taken every 4 hours on 78 transequatorial voyages between Pago Pago (14S 171W) and Honolulu (21N 158W) over a period of nine years. This time CIN 158W) over a period of nine years. This time series of systematic measurements permits reliable estimates of certain climatological features. Anomalous conditions appear clearly in specific years. Navifacial temperature is portrayed by isotherms on a graph with latitude and time as coordinates, and navifacial salinity is portrayed by isohalines on a similar graph. Anomalously high temperatures, especially within 5 degrees of the equator, occurred during parts of the years 1957-1959 and 1963-1965. Mean annual variations also are portrayed against latitude. Of special interest, the equatorial thermal minimum is found to be lowest twice a year in February and September, and some evidence is found that this double cycle is related to the strength of the trade winds near the equator. Salinity and precipitation are compared with each other in their variations with latitude and season; the results are inconclusive. (Jerome - Vanderbilt)

SPECTRA OF THE TEMPERATURE AND HU-MIDITY FLUCTUATIONS IN THE MARINE BOUNDARY LAYER, Commonwealth Scientific and Industrial Research Organization, Sydney (Australia). For primary bibliographic entry see Field 07B. W73-13455

UNBOUNDED STRATIFIED FLOW OVER A VERTICAL BARRIER, Case Western Reserve Univ., Cleveland, Ohio. Div. of Fluid, Thermal and Aerospace Sciences. For primary bibliographic entry see Field 08B. W73-13459

WARM WATER ADVECTION IN THE SOUTHERN BEAUFORT SEA AUGUST-SE-PTEMBER 1971, Coast Guard Washington, D.C. Oceanographic

G. L. Hufford.

Journal of Geophysical Research, Vol 78, No 15, p 2702-2707, May 1973. 5 fig, 14 ref.

Descriptors: *Ocean currents, *Seasonal, *Heated water, *Advection, Oceanography, Ocean circulation, Summer, Pacific coast region, Temperature, Salinity, Density, Stratified flow, Thermal stratifi-

Identifiers: *Beaufort Sea.

Oceanographic features of the Southern Beaufort Sea were studied during August-September 1971. The data indicated the presence of a relatively warm layer (0.1-5.0°C) in the continental shelf waters. This situation has only been reported once previously. The layer averaging 25 meters in thickness was traced from 154 degrees 30 minutes west to 143 degrees 42 minutes west. The layer decreased in temperature toward the east but

salinity remained relatively constant. Direct cursainity remained relatively constant. Direct current measurements in the warm water layer indicate an eastward flow, suggesting a Bering Sea-Chukchi Sea origin. This hypothesis was supported by a water mass analysis. Investigation of available data indicated the presence of the warm water layer in the Southern Beaufort Sea during the summer in 10 of the 16 years examined. (Jerome-Vanderbilt)

UPPER MISSISSIPPI COMPREHENSIVE BASIN STUDY, APPENDIX D.-SURFACE WATER HYDROLOGY.

Army Engineer District, St. Paul, Minn. For primary bibliographic entry see Field 06B.

UPPER MISSISSIPPI RIVER COMPREHENSIVE BASIN STUDY, APPENDIX 1-FLOOD CON-Army Engineer District, Chicago, Ill. For primary bibliographic entry see Field 06B. W73-13489

FLOOD OF MARCH 19-20, 1970,
METROPOLITAN BIRMINGHAM AND JEFFERSON COUNTY, ALABAMA,
Geological Survey, University, Ala.
For primary bibliographic entry see Field 07C.
W73-13521

2F. Groundwater

MEASUREMENT OF GROUNDWATER FLOW USING AN IN-SITU THERMAL PROBE, New Mexico Inst. of Mining and Technology, Secorto. Dept. of Geoscience. M. A. Reiter, and A. R. Sanford.

M. A. Ketter, and A. K. Santord. Available from the National Technical Informa-tion Service as PB-222 465, 33.00 in paper copy, \$1.45 in microfiche. New Mexico Water Resources Research Institute Las Cruces Technical Completion Report No 027, 1973. 31 p, 4 tab, 11 fig, 2 ref. OWRR A-042-NMEX (1).

conductivity, Geophysics, Hydrogeology, Aquifers, *Boreholes, New Mexico, *Base flow, Measurement, Water temperature, Instrumentation, Testing.

Identifiers: *Thermal probe, *Groundwater flow measurement, Well geometrics, Cased borehole, Uncased borehole. Descriptors: *Groundwater movement, *Thermal

Uncased borehole.

A thermal probe for the in-situ measurement of groundwater flow in a borehole was constructed and calibrated in a horizontal position. The probe is a long slender metal rod having a heat source along its entire length and a temperature sensor at its midpoint. When a constant quantity of heat is applied to the probe, the rise in temperature is inversely related to the rate of water flow past the probe. Full-scale calibration of the probe was considered necessary because theoretical studies oversimplify the interaction between the heated probe and the horizontal flow of groundwater. The apparatus for calibration consists of a central sand-filled chamber having a horizontal hole lined with well-screen in its center. The central chamber is hydrologically connected to two taller water flow. Over 40 calibrations of the thermal probe were made, but most of these tests were used to perfect experimental techniques. However, 8 of the calibration runs were considered sufficiently accurate to construct preliminary Master Curves. These curves indicate that if temperature differences of 0.1 degree Centrigade can be measured at the end of a two hour test, the probe is capable of distinguishing changes in rate of water flow of 0.0005 cucm/sec/sq/cm. (Creel-New Mexico)

Group 2F-Groundwater

W73-13013

W73-13213

COUPLED SIMULATION OF LEAKY SIMULATION OF COUPLED LEAN AQUIFERS AND SURFACE-WATER SYSTEM, New Mexico Inst. of Mining and Technolog Socorro. Dept. of Geoscience. For primary bibliographic entry see Field 02A.

FINITE ELEMENT SOLUTION TO UNCON-FINED GROUNDWATER FLOW WITH INFIL-TRATION, Rhode Island Univ., Kingston. Dept. of Civil Enary bibliographic entry see Field 05B. W73-13031

WATER LEVELS AND SPRING DISCHARGES FOR SELECTED WELLS AND SPRINGS IN NEVADA, 1966-69, Geological Survey, Lakewood, Colo. For primary bibliographic entry see Field 04B. W73-13048

DETECTION OF FRESH WATER AQUIFERS IN THE GLACIAL DEPOSITS OF NORTHWESTERN MISSOURI BY GEOELEC-TRICAL METHODS,
Missouri Univ., Rolla. Geophysical Observatory.
For primary bibliographic entry see Field 04B.

RELATIONSHIP BETWEEN THE CARBON ISOTOPE COMPOSITION OF SOIL CO2 AND DISSOLVED CARBONATE SPECIES IN GROUNDWATER,

Geological Survey, Washington, D.C. For primary bibliographic entry see Field 02K. W73-13360

HYDROCHEMICAL ENVIRONMENTS OF CARBONATE TERRAINS. McMaster Univ., Hamilton (Ontario). Dept. of Geography.
For primary bibliographic entry see Field 02K. W73-13361

ANALYTIC SOLUTION OF SPATIALLY DIS-CRETIZED GROUNDWATER FLOW EQUA-TIONS, Geological Survey, Iowa City, Iowa.

L. K. Kuiper.

Water Resources Research, Vol 9, No 4, p 1094-1097, August 1973. 1 fig. 4 ref.

Descriptors: *Mathematical studies, *Ground-water movement, Numerical analysis, Finite element analysis.

The Galerkin procedure, when it is applied to the equation for horizontal two-dimensional flow of groundwater in a nonhomogeneous isotropic aquifer, generates approximating equations involving square matrices and column matrices. An analytic solution to the matrix equation is given. These methods are compared with the approximate numerical Crank-Nicholson procedure by applying both to a particular problem for which the unknown column matrix has 49 elements. The Crank-Nicholson procedure usually requires less computation time for the confined aquifer case but gives errors for drawdown averaging approximately 10%. The Crank-Nicholson procedure takes considerably more computation time for the unconfined case when elapsed time is long. (Knapp-USGS)

ON THE ANALYSIS OF 'SLUG TEST' DATA, Geological Survey, Washington, D.C.

USGS)

S. S. Papadopulos, J. D. Bredehoeft, and H. H. Cooper, Jr.
Water Resources Research, Vol 9, No 4, p 1087-1089, August 1973. 1 fig, 1 tab, 4 ref.

Descriptors: *Aquifer testing, *Drawdown, Groundwater movement, Transmissivity, Water yield, Storage coefficient. Identifiers: *Slug tests.

Methods of analyzing 'slug test' data are reviewed, and additional type curves for the analy-sis of test data from formations with very low storage coefficients are presented. (Knapp-USGS) W73-13369

ON THE UPTAKE OF TRITIUM BY SOIL WATER AND GROUNDWATER, National Center for Atmospheric Research, Boulder, Colo. For primary bibliographic entry see Field 02F. W73-13372

ON THE UPTAKE OF TRITIUM BY SOIL WATER AND GROUNDWATER, National Center for Atmospheric Research, Boulder, Colo.
D. H. Ehhalt. Water Resources Research, Vol 9, No 4, p 1073-1074, August 1973. 1 tab, 5 ref.

Descriptors: *Tritium, *Tracers, *Soil water, *Groundwater, Soil bacteria, Evaporation, Precipitation (Atmospheric), Oxidation.

Tritiated molecular hydrogen in the atmosphere is oxidized by soil microorganisms and may contribute to the T input into soil with a rate of 5.4 T attoute to the 1 input into soil with a rate of 5.4 T atom per sq cm per sec. Thus groundwater studies using HTO as a tracer should take this additional T input into account, and measurements of the uptake of HT by local soil, along with the T deposition by rain, may be required to give correct results. (Knapp-USGS)
W73-13372

EFFECT OF ACCRETION ON DYNAMICS OF GROUNDWATER BETWEEN TWO CHAN-

S, enska Akademie Vied, Bratislava (C-oslovakia). Ustav Hydrologie a Hydrauliky.

Water Resources Research, Vol 9, No 4, p 1058-1064, August 1973. 6 fig, 5 ref.

Descriptors: *Groundwater movement, *Surface-groundwater relationships, *Mathematical studies, Recharge, Evapotranspiration, Water balance, In-filtration, Evaporation, Seepage.

The effects of infiltration and evaporation on groundwater level and on the amount of seepage to or from channels that bound an unconfined aquifer were studied mathematically. The actual free-surface boundary conditions as well as the exact differential equation were used to obtain the general solution. Three particular cases were studied in detail. In the first, the accretion is considered to be constant, whereas, in the second, it is considered to vary linearly with time. In the third, the accretion occurs only on a part of the aquifer but does not occur on the other parts. For the three cases, the rate of seepage is given in mathematical forms as well as in dimensionless curves. The free-surface profile was also drawn for several cases. A as well as in dimensionless curves. The free-surface profile was also drawn for several cases. A comparison with the solutions based on the Boussinesq equation is presented. These approximate solutions give satisfactory results for shallow aquifers but fail to give reasonably adequate results for relatively thick aquifers. The results of these approximate methods deviate greatly from the exact solutions for small values of time. (K-nexact ISGS)

CLOGGING IN SIMULATED GLACIAL AQUIFERS DUE TO ARTIFICIAL RECHARGE. Illinois Univ., Chicago. Dept. of Geologica Sciences. GLACIAL For primary bibliographic entry see Field 04B. W73-13374

VISCOUS FINGER WAVELENGTH DEGENERATION IN HELE-SHAW MODELS, Purdue Univ., Lafayette, Ind. School of Chemical Purdue Univ., Language Engineering. S. P. Gupta, J. E. Varnon, and R. A. Greenkorn. Water Resources Research, Vol 9, No 4, p 1039-1046, August 1973. 8 fig, 1 tab, 14 ref.

Descriptors: "Model studies, "Infiltration, "Hydraulic models, "Porous media, Oil-water interfaces, Mixing, Saline water intrusion." Identifiers: "Hele-Shaw models, Multiphase flow.

Identifiers: "Hele-Shaw models, Multiphase flow. The displacement of one fluid by another (miscible or immiscible) in porous media is an important phenomenon that occurs in groundwater movement and oil reservoir engineering. Practical examples are water flooding, solvent flooding, saltwater intrusion into coastal aquifers, and coning. Viscous fingering was studied in Hele-Shaw models. For an immiscible displacement, dispersive and relative permeability phenomena are absent. The investigation covered the entire scope of finger development from the incipient fingers predicted by Chuoke's theory to a parallel-sided single finger. Results of several experiments run in a Hele-Shaw cell with and without local heterogeneities show wavelength degeneration to one finger for different flow conditions and for different initial numbers of fingers. It was also found that the rate of growth develops almost immediately, well before the fingers are parallel sided. The mechanisms of wavelength generation and degeneration are discussed. (Knapp-USGS) W73-13375

MODIFIED MONTE CARLO APPLICATION TO GROUNDWATER MOVEMENT—THE SIMUL-TANEITY PROCEDURES, Central and Southern Florida Flood Control Dis-trict, West Palm Beach. S-F. Shih.

Water Resources Research, Vol 9, No 4, p 1029-1038, August 1973. 4 fig, 6 tab, 11 ref.

Descriptors: "Groundwater movement, "Monte Carlo method, "Mathematical studies, Soil water movement, Statistical methods, Computers, Drawdown, Computer programs.

Identifiers: Simultaneity procedures.

By applying the Monte Carlo methods to problems of water movement in soils, very difficult problems can often be treated easily, and solutions at only a few points in a flow system can be obtained independently. A modified Monte Carlo application, termed the simultaneity procedure, hastens the classical Monte Carlo application, so that the simultaneity procedure can be used more widely, the techniques of a parallel simultaneity procedure and a successive simultaneity procedure were devised. Examples are presented not only for the problems of groundwater movenot only for the problems of groundwater move-ment and Thiessen coefficients but also for the ment and Thiessen coefficients but also for the problems of general mathematics. Comparisons of results indicate that the simultaneity procedure has the same accuracy as the classical Monte Carlo method, but the computing time is reduced by approximately 30%-60%. (Knapp-USGS) W73-13376

EQUATION FOR ONE-DIMENSIONAL VERTICAL FLOW OF GROUNDWATER: 1. THE RIGOROUS THEORY, Centro di Ricerca IBM di Venezia (Italy). G. Gambolati.

er Resources Research, Vol 9, No 4, p 1022-1028, August 1973, 14 ref.

Descriptors: *Groundwater movement, *Mathematical studies, *Unsteady flow, Porous media, Deformation, Equations, Elastic deformation, Elastic theory, Hydraulic conductivity, Saturated flow, Stress, Strain.

A new mathematical derivation of the one-dimer sional flow equation in an elastic, saturated, porous medium is presented. The approach involves the consideration of a fixed elemental volume in fixed coordinates. The derivation is volume in fixed coordinates. In elevation is developed by starting from both Lagrangian and Eulerian definitions of the position vector. The Lagrangian and Eulerian formulations prove to be equivalent and provide the same outcome if they are correctly interpreted and consistently applied. The rigorous equation contains an additional non-The rigorous equation contains an additional non-linearity resulting from the correct expansion of the partial spatial derivative of the grain velocity. It is also shown that an approach based on a deforming element in fixed coordinates is simple and straightforward, since it does not introduce the grain velocity into the development. However, it needs a particular definition for the compressi-bility different from the classical one. It is proved that these two compressibilities are not equalthat these two compressibilities are not equal; their mathematical link is derived. (Knapp-USGS)

INTEGRODIFFERENTIAL EQUATIONS FOR SYSTEMS OF LEAKY AQUIFERS AND APPLICATIONS: 1. THE NATURE OF APPROXI-

MATE THEORIES, Universidad Nacional Autonoma de Mexico, Mex-

Onversidat Nacional Autonoma de Mexico, Mexico City. Instituto de Geofísica.

I. Herrera, and L. Rodarte.

Water Resources Research, Vol 9, No 4, p 9951005, August 1973. 4 fig, 27 ref.

Descriptors: *Groundwater movement, *Mathematical studies, *Equations, Aquifer characteristics, Aquicludes, Hydrogeology. Identifiers: *Leaky aquifers.

The dynamics of leaky aquifers are described by a system of integrodifferential equations. Alternative expressions for the memory functions are obtained, and it is shown that approximate theories of leaky aquifers correspond to several ways of approximating the memory functions. By means of analysis of these functions in the time domain it is possible to achieve a better understanding of the possible to achieve a better understanding of the nature of these approximations as well as to foresee the possibility of their application to new situations. These types of results constitute impor-tant steps toward making the integrodifferential equations a powerful method of analysis of the equations a powerful method of analysis of the very complex situations arising in the study of actual leaky aquifer systems. They can also be used to construct improved, simplified methods for numerical computation. (Knapp-USGS) W73-13378

EFFECT OF SOLUTE DISPERSION ON THER-MAL CONVENTION IN A POROUS MEDIUM

LAYER, Technion-Israel Inst. of Tech., Haifa. Dept. of Civil Engineering. H. Rubin.

Water Resources Research, Vol 9, No 4, p 968-974, August 1973. 2 fig, 9 ref.

Descriptors: *Convection, *Dispersion, *Ground-water movement, *Saline water intrusion, Mixing, Mathematical studies, Water temperature, Salini-ty, Steady flow, Unsteady flow.

Thermal convection may sometimes play an important role in salt diffusion in an aquifer. In such cases hot saline water is in the deep layers of the aquifer, from which salt diffuses into the upper freshwater. Often the horizontal steady flow of the water in the aquifer increases the rate of diffusion of solutes. Salt diffusion is then characterized by the anisotropic dispersion tensor. Dispersion of the solutes reduces the stabilizing effect of the salinity profile but increases the stability of the flow field to pure overstable motions. Dispersion also changes the dimensions of Benard cells in the porous medium. Fluctuations of the dispersion tensor affect the stability criteria of the flow field but cause very small overstable motions that distort the convective current cells. (Knapp-USGS) W73-13381

GROUNDWATER HYDROLOGY OF PRAIRIE POTHOLES IN NORTH DAKOTA Geological Survey, Washington, D.C. C. E. Sloan.

Available from GPO, Washington, D C 20402 Price \$0.70. Geological Survey Professional Paper 585-C, 1972. 28 p, 22 fig, 2 plate, 1 photo, 7 tab, 29

Descriptors: "Hydrogeology, "Surface-ground-water relationships, "Grasslands, "Lakes, Playas, Glacial drift, Water balance, Evapotranspiration, Groundwater movement, Salinity, Water table, "North Dakota.

Identifiers: *Prairie potholes.

Prairie potholes are water-holding depressions of glacial origin in the prairies of the Northern United States and southern Canada. Because potholes generally do not overflow, seepage outflow is the principal way in which dissolved salts can be removed. Salinity of pothole water is therefore a good indication of the seepage balance. Net seepage outflow results in fresh to brackish waters seepage outflow results in fresh to brackish waters that constitute ephemeral to semipermanent ponds, whereas net seepage inflow results in brackish to saline waters that constitute semiper-manent to permanent ponds. Because the water table in the glacial deposits is continuous with the water surface in prairie potholes, the water-table gradient is adjusted to the water-surface elevation of the potholes. Groundwater flows toward the pothole if the adjacent water table is higher than pothole water surface and flows away from the pothole if the adjacent water table is lower than the pothole water surface. Prairie potholes were ed in North Dakota on the Coteau du Missou ri, an area of stagnation moraine. Because joints in glacial till are most numerous near the land surface (owing to weathering effects), the most active dwater flow systems are shallow and localgroundwater flow systems are snaudw and localized in the vicinity of potholes. As a result, local groundwater flow systems have a noticeable effect on pothole hydrology, particularly the salinity. (Knapp-USGS) W73-13383

UPPER MISSISSIPPI COMPREHENSIVE BASIN STUDY, APPENDIX E-GROUND WATER AND GEOLOGY. For primary bibliographic entry see Field 06B. W73-13485

GROUND-WATER DISCHARGE FROM THE GROUND-WATER DISCHARGE FROM THE EDWARDS AND ASSOCIATED LIMESTONES, SAN ANTONIO AREA, TEXAS, 1972. Geological Survey, Austin, Tex. For primary bibliographic entry see Field 04B. W73-13515

WATER RESOURCES AND GEOLOGY OF MOUNT RUSHMORE NATIONAL MEMORIAL.

MOUNT KUSHMORE NATIONAL MEMORIAL, SOUTH DAKOTA, Geological Survey, Washington, D.C. J. E. Powell, J. J. Norton, and D. G. Adolphson. Available from GPO, Washington, D.C. 20402 Price \$1.25. Water-Supply Paper 1865, 1973. 50 p, 9 fig, 1 plate, 3 tab, 20 ref.

Descriptors: "Groundwater resources, "Water supply, "National parks, Geology, Hydrogeology, Joints (Geologic), National monuments, Alluvium, Aquifers, "South Dakota.

Identifiers: *Mt. Rushmore National Memorial (S. Dak).

Groundwater suitable for public supply can be obtained from fractured metamorphic and igneous rocks at Mount Rushmore National Memorial, S. Dak. Mica schist is the most abundant rock in the memorial. The more prominent hills and mountains, however, are in large, northerly striking granite sills, some of which are several hundred feet thick. Pegmatite sills and dikes are also numerous. At some locations in the memorial, granite or pegmatite sills act as groundwater dams preventing the movement of groundwater dams preventing the movement of groundwater down gradient. The occurrence of groundwater is dependent upon the presence of joints and fractures in the schist and granite bedrock. The rocks themselves are relatively impermeable and would yield selves are relatively impermeable and would yield little or no water in their unaltered state. Ground-water is also available from alluvium in major val-leys such as Starling basin and the valleys of Grizzly Bear Creek and Battle Creek. Several locations in the memorial have potential as future sources of groundwater supplies. Developed and potential water resources in the memorial probably are sufficient to meet demands beyond the year 2000. (Knapp-USGS)

SUBSIDENCE OF THE VENICE AREA DURING THE PAST 40,000 YR, Laboratoire de Geologie Dynamique, Paris

(France).
J. Ch. Fontes, and G. Bortolami.
Nature, Vol 244, No 5415, p 339-341, August 10, 1973. 2 fig, 16 ref.

Descriptors: *Land subsidence, *Withdrawal, *Drawdown, *Paleohydrology, Radioactive dating, Sedimentation, Stratigraphy, Carbon ing, radioisotopes. Identifiers: *Venice (Italy).

Subsidence of the Quaternary deposits of the plain of Venice may be the result of geological factors or of human activity over several centuries, such as overexploitation in the confined aquifers and urban and industrial development on unconurban and industrial development on uncon-solidated sediments. The respective contribution of the factors affecting subsidence may vary from place to place. Drilling, continuous coring, and seismic profiles provide average sedimentation rates of about 0.5 to 1.0 mm per yr since the Upper Pliocene. Geodesic studies, available since the early 1900's show that in some places the surface is now sinking at a velocity close to 8 mm per yr. In order to shut the seclogical component of suborder to study the geological component of sub-sidence at an intermediary time scale, systematic sidence at an intermentary time scane, 35 sources analysis of the chronology of the upper Quaternary deposits was undertaken using C-14 measurements. From about 40,000 to 22,000 yr BP the cornection of the characteristic scane. relation between age and depth is lin ar. The slo yr BP a high sedimentation rate (about 4 mm per yr) produced at least 17 m of deposits. The rate of marine deposition decreased between 5,900 and 2,020 yr BP. The beginning of human settlement in the area seems to have coincided with a period of ground stability. (Knapp-USGS)

THE SIGNIFICANCE OF THE SOLUTION OF FELDSPAR IN POROSITY DEVELOPMENT, West Virginia Univ., Morgantown. Dept. of Geology and Geography. For primary bibliographic entry see Field 02J. W73-13537

THEORY AND PROBLEMS OF WATER PER-

COLATION, Bureau of Reclamation, Denver, Colo. For primary bibliographic entry see Field 08D. W73-13563

Group 2F-Groundwater

2G. Water in Soils

TRANSIENT VIBRATION TECHNIQUES TO DETERMINE WAVE VELOCITIES IN-SITU, Kentucky Univ., Lexington. Dept. of Civil En-

M Sc Thesis, 1972. 215 p, 23 fig, 6 tab, 67 ref, 11 append. OWRR A-026-KY (2).

Descriptors: *Seismic studies, *Seismic proper-ties, *Soil dynamics, *Foundation investigations, *Seismic waves, Exploration, Soil physical pro-perties, Soil investigations. Identifiers: Seismic wave velocities

Seismic velocity profiling was tested at two sites by two seismic refraction methods, the sledge hammer method and the crosshole shooting hammer method and the crosshole shooting method. Reliable measurements of shear wave velocity in field could be made from crosshole shooting data, provided data were interpreted properly. A new method to determine R-wave velocities uses the data from the sledge hammer method. A procedure is outlined for conducting crosshole shooting. In the Laboratory, resonant column tests were run to determine shear wave velocities for the two test sites. The laboratory and field shear wave velocities were correlated by taking into account the sample disturbance and time effects. (Kanpp-USGS) W73-13055

A STOCHASTIC MODEL FOR THE OCCUR-RENCE OF MOISTURE IN VADOSE MEDIA, Clemson Univ., S.C. H-Ih. Chien.

PhD Thesis, August 1972. 138 p, 41 tab, 88 equ, 151 ref, append. OWRR-A-014-SC (4) and A-023-

Descriptors: Hydrology, *Soil moisture, Behavior, *Simulation analysis, *Markiv processes, *Stochastic processes, *Model studies, *Rainfall-runoff relationships, Probability, Distributions, Predicting, Surface runoff, Storage, Deep percolation, Evapostranspiration, Precipitation, Digital computers, Optimization, Systems

Identifiers: *Vadose media, Vertical movements, Soil moisture losses.

Two- and six-state Markov chain models are developed to predict the periodic vertical distrib tion of moisture at the ground surface and within the layers of the soil profile. The probabilities of transition of moisture between the concerned states are estimated and generalized. Weekly data for the accumulated rainfall and surface runoff and the initial soil moisture storage were measured at the Clemson Research Watershed; the observed at the Clemson Research Watershed; the observed data (December 1965 through October 1969) are employed as the input of the proposed model. The associated transition probabilities are estimated and then optimized through a digital computer program based on theories of discrete stationary Markov chain and the maximum likelihood estimation. The predicted vertical distribution of moisture is found to approximate closely the actually observed distribution. The applications of the control of the contro The predicted vertical distribution of moisture is found to approximate closely the actually observed distribution. The probabilities of losses of soil moisture due to deep percolation and evapotranspiration from various depths of the soil profile are determined. The probability of infiltration into the ground surface and the probability of evapotranspiration losses from the entire moisture storage are also estimated. These probabilities are useful in calculating the absolute amounts of deep percolation, evapotranspiration and infiltration, and in predicting the absolute amounts of moisture in soil layers. (Bell-Cornell)

STUDIES ON THE SOIL-WATER SYSTEM IN THE FIELD: II. STATISTICAL CONSIDERA-

TION ON THE SOIL MOISTURE CONTENT (IN JAPANESS), Utsunomiya Univ., Tochigi (Japan). Coll. of Agriculture.

K. Soma.
Bull Coll Agric Utsunomiya Univ. Vol 8, No 2, p
81-92, 1972. Illus. English summary.
Identifiers: Distribution patterns, Moisture, Samples, Season, Size, *Soil moisture, Statistical
methods, System.

In the soil layer of a lysimeter the distribution of moisture content is usually normal in 15 x 15 cm section sampling (n \pm 36) but seems to be non-inform in each layer. This was caused by compaction in the soil tank. The fluctuation of measured values is larger in the upper layers. If a risk ratio alpha \pm 3% and an accuracy epsilon \pm 5% are accepted, the necessary sampling number for estimating the population is about 10 for moisture content. The distribution of moisture content in whole year (n \pm 254) is normal for every layer, but there tent. The distribution of moisture content in wasse-year (n ± 254) is normal for every layer, but there is a fair difference between characteristics of these distributions. Soil moisture fluctuates more in summer than winter.—Copyright 1973, Biological Abstracts, Inc. W73-13091

COMPETITION BETWEEN GRASS AND CLOVER FOR PHOSPHATE: II. EFFECT OF ROOT ACTIVITY, EFFICIENCY OF RESPONSE TO PHOSPHATE, AND SOIL MOISTURE, Department of Scientific and Industrial Research, Palmerston North (New Zealand). Grassland Div. For primary bibliographic entry see Field 03F. W73-13097

INFLUENCE OF SURFACE SOIL CONDITIONS ON DRYING IN EARLY SPRING, Macdonald Coll., Montreal (Quebec). Dept. of Soil Science. For primary bibliographic entry see Field 03F.

SALINITY AND DRAINAGE IN A BROWN CHERNOZEM IRRIGATED AT DIFFERENT MINIMUM MOISTURE CONTENTS,
Department of Agriculture, Lethbridge (Alberta).
Research Station. Research Station.
For primary bibliographic entry see Field 03C.
W73-13109

NITROGEN BALANCE IN SOIL COLUMNS IN-TERMITTENTLY FLOODED WITH SECONDA-RY SEWAGE EFFLUENT, Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 05B.
W73-13116

DEFORMATIONAL STRUCE BRAZILIAN COASTAL DUNES, STRUCTURES BRAZILIAN COSTAL DUNES, Geological Survey, Denver, Colo. E. D. McKee, and J. J. Bigarella. J Sediment Petrology. Vol 42, No 3, p 670-681. 1972. Illus. entifiers: *Brazilian coastal dunes, *Dunes (Deformation), Roots.

Coastal dunes of Brazil differ considerably from Coastal dunes of Brazil differ considerably from desert dunes in their internal structure primarily because of differences in the degree of cohesion within the sand. The coastal dunes formed under conditions of high humidity and heavy rainfall, and the avalanching of sand on the lee sides of these dunes has produced many distinctive deformational structures characteristic of wet, cohesive sand. The roots of plants growing on the dunes have further contorted and ruptured cross-lamination in the dunes, forming additional distinctive structures.—Copyright 1973, Biological Abstracts, Inc. W73-13123

WATER TRANSMISSION PROPERTIES OF AN

ASPHALT BARRIER, Minnesota Univ., St. Paul. Dept. of Soil Science. J. P. Palta, G. R. Blake, and D. A. Farrell. Soil Sci Soc Am Proc. Vol 36, No 5, p 709-714.

Identifiers: *Asphalt barrier, Capillary potential, Discontinuities, Flow, Soils, *Water transmission, *Steady flowSoil columns). Discontinu

The water transmission properties of an asphalt barrier were studied using samples taken from a barrier formed in Zimmerman fine sand. Steady flow experiments using a 9.0-cm diameter soil column showed that water movement through the column showed that water movement through the barrier was affected by the capillary potentials on both sides of the barrier if these potentials exceeded a critical value or 'break point' which ranged from minus 21 to minus 20 cm depending on the flow rate. This steady value increased from minus 4.3 to minus 1.5 cm when the flow rate was increased from 0.099-0.058 cm/hr. The hysteretic flow properties of the barrier are explained using a model based on the following assumptions: flow occurs mainly through cracks of varying width, and the ratio of the draining to wetting potentials of the cracks exceeds unity and is independent of crack size.—Copyright 1973, Biological Abstracts, Inc. Inc. W73-13126

INFLUENCE OF SOIL BULK DENSITY AND

INFLUENCE OF SOIL BUILK DENSITY AND MATRIC PRESSURE ON SOIL RESISTANCE TO PENETRATION,
H. F. Mirreh, and J. W. Ketcheson.
Can J Soil Sci. Vol 52, No 3, p 477-483. 1972. Illus. Identifiers: Bulk density, "Mathematical models, Matric pressure, "Soils (Clay loam), Soil penetration resistance, Regression analysis.

Cylinders of a clay loam soil were adjusted to dif-Cylinders of a clay loam soil were adjusted to dif-ferent bulk density and matric pressure combina-tions to study soil resistance to a penetrating probe. Regression analysis of the penetrometer data was conducted. A 3-dimensional plot of the generated soil resistance values was constructed to illustrate the nature of the interaction. At any 1 tions on root growth and soil management are briefly discussed.--Copyright 1973, Biological Abstracts, Inc. W73-13127

POLLUTION OF KARST AQUIFERS, For primary bibliographic entry see Field 05B. W73-13203

COMPARATIVE EXTRACTION OF CHLORINATED HYDROCARBON INSECTI-CIDES FROM SOILS 20 YEARS AFTER TREAT-

MENT, Agricultural Research Service, Beltsville, Md. Agricultural Environmental Quality Inst. For primary bibliographic entry see Field 05B. W73-13285

LITERATURE PERTAINING TO WATER QUALITY AND QUANTITY IN UNSATURATED POROUS MEDIA, Arizona Univ., Tucson. Dept. of Hydrology and Water Resources. For primary bibliographic entry see Field 05B. W73-13302

PHYSICAL PROBLEMS AND THEIR AMELIORATION IN SALTY SOILS, Department of Overseas Trade, Canberra (Australia). Trade Commissioner Service. THEIR The Journal of the Australian Institute of Agricultural Science, Vol 37, No 4, p 314-326, December 1971, 5 fig. 88 ref.

Descriptors: *Alkaline soils, Australia, *Soil physical properties, *Hydrologic properties, *Hydrologic properties, *Hydrologic properties, *Hydrologic properties, Exporation, Excess water (Soils), Gypsum, Benefits, Crop response, Land reclamation. Identifiers: *Australia (Riverine Plain).

Sodic soils of the Riverine plain, Australia, present a problem because of their poor physical characteristics which tend to be unstable under the action of water, and disperse to form an infiltraaction of water, and disperse to form an infiltra-tion barrier at the surface. Their hydraulic conduc-tivity is low; and they are prone to high intensity cracking, along with an evaporation rate which may equal that from surface soil, causing the dry-ing rate to accelerate. Strata with sodic properties may form in the subsoil and cause water logging problems in the surface layers. Application of gyp-sum has been shown to give short-term improvisum has been shown to give short-term improve-ments: increased hydraulic conductivity, im-proved water intake and increased porosity. These improvements are manifested in improved germination and higher yields—at least with some crops. Tillage combined with gypsum applications may give short-term increases in water penetration. Long-term reclamation of sodic soils may never be achieved at a realistic cost level. Combinating deep tillage+gypsum+nitrogen+pasture+accurate surface levels is suggested as the best solution at present. (Bahre-Arizona)
W73-13308

PEDOGENIC CALCITE ACCUMULATION IN ARID AND SEMIARID REGIONS OF THE IN-DO-GANGETIC ALLUVIAL PLAIN OF ERST-MORPHOLOGY AND ORIGIN,
Gheat Rijkanaiyanaiyanaiyan

Ghent Rijksuniversiteit (Belgium). Geologisch In-

struut. J. L. Sehgal, and G. Stoops. Geoderma, Vol 8, No 1, p 59-72. 1972.

Descriptors: *Calcareous soils, *Soil texture, *Calcite, *Saturated soils, *Saline soils, Alluvial fans, Arid lands, Soil chemical properties, Crystal growth. Identifiers: *India (Punjab), Pedogenesis, Thar

The evolution of the pedogenic calcite formation is investigated by studying the climate of the plain grades from arid and hot to semi-arid and hot to less hot, and the soils, respectively, from Camborthids, through Calciorthids and Ustochrepts, to Haplustalfs. Nine different forms of calcite accumulations from microcrystalline calcite to coarsely recrystallized crystallaria are distinguished and described. They may form combinations which are characteristic for specific soil conditions. An evolution pattern of different forms could be determined, not only within profiles, but also among different soil types of the sequence; the highest complexity being found in calcic horizons. Specific forms were observed in the saline and water-logged soils. The origin of the different calcareous accumulations is discussed and authigenic character of the calcitic nodules is propounded. In the scope of these findings, the use of the suffix Ca (Calcite) in horizon designation is considered. (Bahre-Arizona) ations from microcrystalline calcite to coarsely re-Arizona) W73-13311

PRAIRIE SANDREED (CALAMOVILFA LON-GIFOLIA): WATER INFILTRATION AND USE, Agricultural Research Service, Sidney, Mont. For primary bibliographic entry see Field 02I. W73-13312

A COMPARATIVE STUDY OF SOIL VERSUS FOLIAR APPLICATION OF AMMONIUM

NITRATE TO WHEAT UNDER DIFFERENT

MOISTURE REGIMES, Newe Yaar Experiment Station (Israel). Div. of Forage Crops and Pasture. For primary bibliographic entry see Field 03F. W73-13313

EFFECT OF WASTE WATER FROM THE AS-TRAKHAN CELLULOSE-PASTEBOARD PLANT ON SOIL PROPERTIES, For primary bibliographic entry see Field 05D. W73-13315

PLANT INDUCED SOIL SALINITY PATTERNS IN TWO SALTBUSH (ATRIPLEX SPP.) COM-

MUNITIES, Commonwealth Scientific and Industrial Research Organization, Deniliquin (Australia). Rivernina

For primary bibliographic entry see Field 03C. W73-13316

CHARACTERISTICS OF HANFORD SOIL AND AQUATIC SEDIMENTS.
Battelle-Pacific Northwest Labs., Richland,

Wash. Ecosystems Dept.
For primary bibliographic entry see Field 05B. W73-13342

RELATIONSHIP BETWEEN THE CARBON ISOTOPE COMPOSITION OF SOIL CO2 AND DISSOLVED CARBONATE SPECIES GROUNDWATER, Geological Survey, Washington, D.C. For primary bibliographic entry see Field 02K. W73-13360

ONE-DIMENSIONAL CONSOLIDATION OF A CLAY LAYER WITH IMPEDED DRAINAGE ROUNDABIES

nois Univ., Urbana. Dept. of Civil Engineering. Water Resources Research, Vol 9, No 4, p 1090-1093, August 1973. 3 fig, 6 ref.

Descriptors: *Consolidation, *Clays, *Soil mechanics, *Drainage effects, Soil physical pro-

The main source of settlement of drained clays is often a single compressible layer bounded above and below by layers that contribute little to total settlement but that have coefficients of permeabilities and thicknesses such that they can be considered neither freely draining nor impervious. Furthermore, the top and bottom drainage layers can have unequal permeabilities and thicknesses. An analytical solution to the one-dimensional consolidation of a clay layer with unlike drainage boundaries is developed, and the results are presented in the form of consolidation versus time to facilitate their use by engineers. (Knapp-USGS) W73-13368 settlement but that have coefficients of permea-

NOTE ON THE INFILTRATION ADVANCE FRONT FROM BORDER IRRIGATION,

ecticut Agricultural Experiment New Haven.

Water Resources Research, Vol 9, No 4, p 1075-1078, August 1973. 1 fig. 7 ref.

Descriptors: *Infiltration, *Border irrigation, Wetting, Soilwater movement, Numerical analysis, Water spreading.

The spreading of a water layer of constant thickness over a near horizontal soil surface is analyzed. The solution was applied consistently for short times. It estimates gravity effects properly by taking into account the pressure head

of the water layer. An infiltration law valid for all times is also suggested to obtain numerical solutions in practical cases. (Knapp-USGS) W73-13371

A NUMERICAL AND SIMILARITY ANALYSIS OF INFILTRATION INTO CRUSTED SOILS, Purdue Univ., Lafayette, Ind.

L. R. Ahuja.

Water Resources Research, Vol 9, No 4, p 987-994, August 1973. 5 fig. 14 ref.

Descriptors: *Infiltration, *Soil water movement, *Surface sealing, *Impact (Rainfall), Numerical analysis, Soil surfaces, Earth-water inter-interfaces, Soil compaction, Wetting, Unsaturated Identifiers: *Crusted soils, *Crusts.

One-dimensional, vertical infiltration of water through a crust of constant nonzero hydraulic resistance is theoretically examined by using a nu-merical solution and a similarity reduction of the problem. The soil-water content at the crust-soil interface increases with time to approach a predictable final steady water content asymptotically. A greater proportion of the flow takes place at inadiate low water contents, and without an appreciable effect of gravity, as the crust re-sistance increases. For the water content at the crust-soil interface, the cumulative infiltration, and the wet front progress, simple expressions arise from the similarity reduction analysis, which is based on specific functional forms of the soilwater diffusivity and suction head, and a relatively small initial soil-water content. For early to intermediate times of flow, the similarity analysis describes adequately the calculated numerical solution flow data for Yolo soil. For intermediate to large times, a Green and Ampt type solution is linked to the similarity expression for cumulative infiltration with fair success. (Knapp-USGS) W73-13379

SIMULTANEOUS TRANSPORT OF SOLUTES AND WATER UNDER TRANSIENT UNSATURATED FLOW CONDITIONS,
Volcani Inst. of Agricultural Research, Bet-Dagan

(Israel). Dept. of Soil Physics. E. Bresler.

Water Resources Research, Vol 9, No 4, p 975-986, August 1973. 5 fig, 22 ref.

Descriptors: *Unsaturated flow, *Unsteady flow, *Mass transfer, *Leaching, *Solutes, Ground-water movement, Convection, Dispersion, Mixing, Aqueous solutions, Path of pollutants, Numerical analysis, Finite element analysis.

Theoretical and mathematical tools are presented for analyzing transient one-dimensional vertical simultaneous transfer of noninteracting solute and water in unsaturated soils. The transient diffusion convection equation is solved numerically by an approach that eliminates the effect of numerical dispersion. The numerical results are compared with some analytical solutions for steady water flow. For transient infiltration the results are compared with field data. These comparisons indicate that the theory as well as the numerical method is reliable and can be used with confidence. Results are given for typical cases of infiltration, redisand their typical cases of infultration, redis-tribution, and evaporation of water from the soil and their effect on dispersion coefficients and salt concentration profiles. (Knapp-USGS) W73-13380

MONITORING SNOW WATER EQUIVALENT BY USING NATURAL SOIL RADIOACTIVITY, National Weather Service, Silver Spring, Md. For primary bibliographic entry see Field 02C.

Group 2G-Water in Soils

NITROGEN-FIXING BLUE-GREEN ALGAE OF SOILS, RICE FIELDS AND EPHEMERAL BASINS OF THE SOUTHERN UKRAINE, (IN For primary bibliographic entry see Field 05C. W73-13391

COPPER ACCUMULATION IN SOILS USED FOR HOP GROWING IN BAVARIA, (IN GER-MAN), Technische Hochschule, Munich (West Germany). For primary bibliographic entry see Field 05B.

Commissariat a l'Energie Atomique, Fontenay-aux-Roses (France). Centre d'Etudes Nucleaires. For primary bibliographic entry see Field 05B. W73-13416

SOIL CONTAMINATION. 2. PENETRATION OF RADIOACTIVE IONS PRESENT IN SOLU-TIONS DUMPED ON THE SURFACE (CON-TAMINATION DES SOLS. COMPORTEMENT DES IONS RADIOACTIFS DANS LES SOLS NON STURES), Commissariat a l'Energie Atomique, Cadarache (France). Centre d'Etudes Nucleaires. For primary bibliographic entry see Field 05B. W73-13417

DISTRIBUTION OF CS137 IN SOILS AND VEGETATION ON THE ISLAND OF PUERTO

Argonne National Lab., Ill. For primary bibliographic entry see Field 05B. W73-13423

FIXING CATION INTERACTION WITH BLISTER-LIKE OSMOTIC SWELLING ON VERMICULITE CLEAVAGES, Wisconsin Univ., Madison. Dept. of Soil Science. K. Sridhar, and M. L. Jackson. Available from NTIS, Springfield, Va., as Coo-1515-42; \$4.00 in paper copy, \$1.45 in microfiche. Report COO-1515-42, 1972. 30 p, 6 fig, 2 tab, 15

Descriptors: *Cation exchange, *Silicates, *Clay minerals, *Expansive clays, Strontium radioisotopes, Osmosis, *Soil treatment, Soil con-tamination, Soil chemical properties, Absorption, Hydrate processes, Fallout.

Blister-like surface configurations on micaceous Buster-like surface configurations on micaceous vermiculitie, produced by osmotic swelling of the interlayers, were studied by replica electron microscopy and by electron microprobe analysis. It is hypothesized that trapping of hydrated cations (Ce, Mg, or fallout \$1500 in blisters occurs since the electrical double layer is thick there. Shrinkage of artificial blisters was greater by treat-ment with KCl solutions as compared with solu-tions of more hydrated cations since the interlayer hydrated cations were more effectively removed. Treatment by 2-hr contact with 1N and 0.01N KC1 solutions completely collapsed artificially pro-blisters but not natural blisters. (Bopp-ORNL) W73-13425

VERTICAL MULCH EFFECTS ON SOIL WATER STORAGE,
Agricultural Research Service, Fort Collins, Colo.

M. L. Fairbourn, and H. R. Gardner.
Soil Sc. Soc Am Proc. Vol 36, No 5, p 823-827.

Identifiers: Diffusivity, Evaporation, *Mulch, *Soil-water storage, Watersheds, Infiltration, *Soil-water storage, *Soil treatments.

Soil water storage for vertical mulch and furrow treatments on level soil surfaces and vertical mulch and nonmulch treatments with micro-

watersheds was evaluated in a constant temperature laboratory. The vertical mulch treatment on a level surface saved 30-40% more of the applied water than the furrow treatment. The efficiency of storage with vertical mulch was reduced by 17% when the surrounding soil surface was wet during water application. A microwatershed with vertical mulch stored 7-10% more of the applied water than a microwatershed without mulch. Depth of water infiltration and dry soil surface adjacent to the mulch appeared to be the factors that reduced evaporation losses from vertical mulch treatments. A comparison of scaled evaporation data with the diffusivity curve for the soil used demonstrated that the diffusivity equation was useful for predicting soil water loss by evaporation for microwatershed treatments of this experiment.—Copyright 1973, Biological Abstracts, Inc.

DIURNAL FLUCTUATIONS IN SOIL WATER POTENTIAL, Duke Univ., Durham, N.C. Dept. of Botany. Place Univ., Durnam, N.C. Dept. of Botany.
E. L. Fiscus, and M. G. Huck.
Plant Soil. Vol 37, No 1, p 197-202. 1972. Illus.
Identifiers: "Diurnal fluctuations, Evapotranspiration, Numeric interpolation, "Psychrometers, Soils, Temperature, Transpiration, Soil-water potential, Hygrometry.

Field data collected from thermocouple psychrometers operated under the control of an automatic switching network and scanning system are presented. A numeric interpolation procedure is described which permits corrections for varying is described which permits corrections for varying sensitivity of the psychrometers over a wide range of temperatures and water potentials. Psychometers installed in ceramic cups buried in soil permeated by an active root system showed a significant day-to-night fluctuation in water potential coincident with the evaporative demands of the plant.—Copyright 1973, Biological Abstracts, Inc. W73-13438

IRRIGATION MANAGEMENT FOR CONTROL OF QUALITY OF IRRIGATION RETURN FLOW,

FLOW, Utah State Univ., Logan. Dept. of Agricultural and Irrigation Engineering. For primary bibliographic entry see Field 05G. W73-13469

A STUDY OF THE BLUE-GREEN ALGAE FROM PADDY FIELD SOILS OF INDIA, Allahabad Univ. (India). Dept. of Botany. For primary bibliographic entry see Field 05C. W73-13498

IMPROVED MERCURY WELL FOR MULTI-PLE TENSIOMETER SYSTEMS

Agricultural Research Service, Mandan, N. Dak. Soil and Water Conservation Research Div. For primary bibliographic entry see Field 07B. W73-13523

COMPARISON BETWEEN COMPRESSIBILITIES OF SANDS AND CLAYS, University of Southern California, Los Angeles. Dept. of Petroleum Engineering. G. V. Chilingarian, C. T. Sawabini, and H. H. Ricke III. Journal of Sedimentary Petrology, Vol 43, No 2 p 529-536, June 1973. 2 fig, 29 ref.

Descriptors: *Compressibility, *Sands, *Clays, Mechanical properties, Compaction, Hydrostatic pressure, Laboratory tests, Sedimentology. Identifiers: *Compressibility (Uniaxial), *Compressibility (Compressibility (Compressibili pressibility (Triaxial).

The pore and bulk volume compressibilities of un-consolidated sands and clays were determined in

triaxial and uniaxial compaction. The bulk compressibilities of unconsolidated sands ranged from 0.00074 to 0.00003 per psi at effective pressure range of 0 to 3,000 psi, whereas the pore volume compressibilities ranged from 0.001 to 0.0001 in the same pressure range using triaxial compaction. These values are greater by about 55% to 100% than those obtained on using uniaxial compaction equipment. The bulk compressibilities obtained on compacting montmorillonite clay saturated in seawater using the triaxial apparatus were found to be about 300% to 500% higher than those obtained on using uniaxial loading in the applied pressure range of 400 to 20,000 psig. A graph is presented comparing the compressibilities of various clays, sands, sandstones, shale, and limestone. Compressibilities of unconsolidated sands appear to be very close to those of clays. Compressibilities of the close to those of clays. Compressibilities of the consolidated sandstones, shales, and carbonates range from 0.00001 to 10 to the minus 7th power per psi in the 500 to 15,000 psi pressure range. (K-nap-USGS)

EFFECTS OF PHOSPHORUS APPLICATION RATE, SOIL PROPERTIES, AND LEACHING MODE ON P-32 MOVEMENT IN SOIL

COLUMNS, Ohio State Univ., Columbus. For primary bibliographic entry see Field 05B. W73-13553

BEHAVIOR OF DETERGENTS (ABS), BACTERIA, AND DISSOLVED SOLIDS IN WATER-SATURATED SOILS, Geological Survey, Denver, Colo. For primary bibliographic entry see Field 05B. W73-13560

EFFECT OF THE RATE OF APPLICATION AND THE VOLUME OF APPLIED WATER ON THE RATE OF MOBILITY OF CERTAIN INSECTICIDES IN CLAY SOIL,
Ain Shams Univ., Cairo (Egypt). Faculty of

Agriculture. For primary W73-13579 ary bibliographic entry see Field 05B.

APPARATUS FOR REMOTE CENTRALIZED MEASUREMENT OF SOIL HUMIDITY BY THE ELECTROMETRIC METHOD, (IN ITALIAN), Turin Univ. (Italy). Istituto di Agronomia Generale e Coltivazioni Erbacee. G. Luppi, and C. Grasso. Riv Agron, Vol 5, No 4, p 303-304. 1971. Illus. En-

glish summary. Identifiers: Apparatus, *Electrometric methods, Humidity, Measurements, *Remote measurement, *Soil humidity.

The apparatus is described. The method is based The apparatus is described. The method is based on the use of revolving telephonic selectors each of which, operated by a telecontrol switchboard, can contact 52 porous blocks successively.—Copyright 1973, Biological Abstracts, Inc. W73-13582

THE SOILS OF THE VILLECARTIER FOREST, Institut National des Sciences Appliquees, Rennes (France). Laboratoire de Mineralogie

(France). Laboratoire de Mineralogie Geotechnique. J. Esteoule, J. Guyader, and J. Touffet. Bull Assoc Fr Etud Sol. No 2 p 29-46, 1971. Illus. Identifiers: Acidic brown soils, Forest, *France (Villecartier Forest), Gley, Humus, Pedogenesis, *Soils, *Vermiculite.

The evolution of these soils is leading to the establishment of acidic brown soils characterized by an acid humus of the moder type, by very low pH's, a considerable desaturation of the complex, and the appearance of vermiculite as the primary

clay mineral. The pronounced acidity of the profile exerts a considerable flocculating effect on the exerts a considerable flocculating effect on the clay-humus complex. The acid evolution and absence of leaching go together with the rather low precipitation that is regularly distributed throughout the year. The relatively flat topography and the muddy texture of the superficial formations create conditions favorable to hydromorphism. The considerable interference of this local factor or climatic activities results in a section of the considerable interference of this local phism. The considerable interference of this local factor on climactic evolution results in a complete range of profiles going from brown acidic soil to hydromorphous soils with pseudogley and gley. Polyphasic soils were also present. In some cases it was difficult to distinguish the characteristics resulting from present pedogenesis from those resulting from previous evolution.—Copyright 1973, Biological Abstracts, Inc.

W73-13604

SOLUBILITY OF MANGANESE IN THE PRESENCE OF SOIL CHEMICALS, Rhode Island Univ., Kingston. For primary bibliographic entry see Field 05B. W73-13645

2H. Lakes

COMPLEXES AFFECTING THE SOLUBILITY OF CALCIUM CARBONATE IN WATER,

Illinois State Water Survey, Champaign.
T. E. Larson, F. W. Sollo, Jr., and F. F. McGurk.
Available from the National Technical Informa-Tion Service as PB-222 496, \$3.30 in paper copy, \$1.45 in microfiche. Illinois Research Report No 68, July 1973. 49 p, 8 tab, 18 ref. OWRR A-051-ILL (1) and S-029-ILL (1). 14-31-0001-3513.

Descriptors: "Hardness (Water), "Calcium carbonate, "Magnesium, Scaling, Corrosion, Solubility, Ions, "Carbonates, "Bicarbonates. Identifiers: "Dissociation constants.

The objectives were to evaluate the dissociation constants of the calcium and magnesium com-plexes with the hydroxide, carbonate, and bicarbonate anions at temperatures of 5, 15, and 25C. This work was conducted at ionic strengths in the range from .002 to .02, corresponding roughly to waters with total dissolved solids contents of 100 to 1,000 mg/l. The dissociation constants have been determined in terms of activities, so that they are valid at least over the range of ionic strength at which the tests were made. A titration method was used to measure the effects of complex formation on the pH of reaction mixtures and appropriate computer programs were developed t calculate the dissociation constants. Dissociation calculate the dissociation constants. Suscellation constants have been developed for the complexes of calcium and magnesium with the hydroxide and carbonate anions at 5, 15, and 25C. The bicarbonate complex of magnesium was studied at 25C, but no reliable and valid dissociation constant for but no reliable and valid dissociation constant for this complex was obtained from the study. It ap-pears probable that the constant for the calcium bicarbonate complex may be equally difficult to evaluate. The development of reliable dissociation constants of the complexes studied in this project, and a method to utilize them in calculating pH would be an aid in producing water of high quality and preventing deterioration of water distribution systems. systems. W73-13004

SULFUR BUDGET OF LAKE SHELBYVILLE, LLINOIS, AND THE EFFECTS OF SULFIDES UPON CHAOBORUS, Blinois Univ., Urbana. Water Resources Center. For primary bibliographic entry see Field 05B. W73-13005

THE EFFECTS OF ENRICHMENT ON LAKE SUPERIOR PERIPHYTON, Wisconsin Univ., Eau Claire. Dept. of Allied

ary bibliographic entry see Field 05C. For primar W73-13011

DROGUE MEASUREMENTS OF THE CIRCU-

DROGUE MEASUREMENTS OF THE CIRCULATION IN GRAND TRAVERSE BAY, LAKE MICHIGAN, Michigan Univ., Ann Arbor. Dept. of Atmospheric and Oceanic Science.

E. C. Monahan, G. T. Kaye, and E. D. Michelena. Available from NTIS, Springfield, Va 22151 as COM-73-10541 Price \$3.00 printed copy; \$1.45 microfiche. Michigan University Sea Grant Program Technical Report 35 (MICHU-SG-73-202), February 1973. 35 p, 21 fig, 11 ref.

Descriptors: *Currents (Water), Data collections, *Lake Michigan, Measurement, Methodology, Buoys, Winds, Wind velocity, *Water circulation, *Michigan.

*Michigan.
Identifiers: *Grand Traverse Bay (Lake Michigan), *Drogue techniques.

In 1970, an intensive multidisciplinary field study was initiated of Grand Traverse Bay of Lake Michigan. The portion of this study directed at obtaining a description of the currents, periodic and aperiodic, that exist in Grand Traverse Bay has inaperious, that exist in Grant haven any incom-volved two distinct types of current measurement: Lagrangian and Eulerian. The application of es-sentially conventional drogue techniques to the quasi-Lagrangian measurement of the circulation sentially conventional drogue techniques to the quasi-Lagrangian measurement of the circulation in Grand Traverse Bay and the results obtained are described. The first measurements were made in the west arm of Grand Traverse Bay on July 23, 1970, using four flag/buoy/Vee drogue units. The float proper is a 1.5-ft diameter, polyurethane disc, 9 inches thick. The polyurethane disc is armored with a fiberuless covering. A 10.ft long. thin. 9 inches thick. The polyurethane disc is armored with a fiberglass covering. A 10-ft long, thinwalled, electrical conduit passes through the center of the float and serves both as a mast for the flag and a rigid point of attachment for the drogue line. Each Vee drogue is composed of two 6- by 4-ft canvas panels laced to rectangular frames of thin-walled conduit. The two panels are hinged together along a pair of 6-ft sides. The effective depth of the current being measured is determined by the length of line used to suspend the Vee drogue beneath the flag-buoy. The drogue trajectories are plotted on charts. Each chart is accompanied by a wind history showing graphically companied by a wind history showing graphical the wind speed and direction. (Woodard-USGS) W73-13033

USE OF COMPUTERS TO COMPUTE UN-STEADY WIND CURRENTS IN BODIES OF WATER AS ILLUSTRATED BY LAKE BAYKAL WATER AS ILLUSTRATED BY LARE BAYKAL
PRIMERENIYE EVM DLYA RASCHETA
NEUSTANOVIVSHIKHSYA VETROVYKH
TECHENIY V VODOYEMAKH (NA PRIMERE
OZ. BAYKAL)),
Gosudarstvennyi Gidrologicheskii Institut, LeninMAGISSEN

Gosudarstvennyi charologicneskii institut, Leiningrad (USSR).
N. A. Davtyan.
In: Rezhim, teoriya, metody rascheta i izmereniya nanosov i stochnykh vod; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 191, p 182-191, Leningrad, 1972. 2 fig, 3 tab, 17 ref.

Descriptors: *Lakes, *Currents (Water), *Winds, Computers, Wind velocity, Wind tides, Turbu-lence, Water levels, Curves, Equations. Identifiers: USSR, *Lake Baykal, *Wind currents, *Drift currents, Gradient currents, Isotachs.

The BESM-3M computer was used to compute wind currents in a deep body of water comparable to that of Lake Baykal (length-680 km; average depth-730 m). Curves are derived for current velocities, turbulent exchange coefficients, water levels, and depths of penetration of drift currents depending on the Chezy coefficient and the rate of

increase in wind velocity. A graph shows the distribution of wind-current velocity with depth and in time. (See also W73-13045) (Josefson-USGS) W73-13045)

THE FALL OVERTURN AND WINTER COOL-ING IN LAKE SUPERIOR,
Texas Univ., Port Aransas. Inst. of Marine

N. P. Smith.

Limnology and Oceanography, Vol 18, No 3, p 483-487, May 1973. 3 fig. 8 ref.

Descriptors: *Lake Superior, *Turnovers, *Mixing, Water temperature, Seasonal, Thermal stratification, Water circulation.

Daily average temperatures and standard devia-tions were computed from two nearshore time se-ries from Lake Superior during the fall overturn and the following period of cooling in winter 1966-67. Temperatures from the 10-m level decrease inregularly to near 0 deg C by mid-February. Average temperatures from the 200-m level crease to 1.9 deg C by late January. The water column becomes isothermal at 4 deg C in early December. Energy density spectra computed from both time series show energy values dropping off exponentially with decreasing period and no significant spectral peaks. (Knapp-USGS) W73-13059

THE EFFECTS OF SEVERAL WEATHER DISTURBANCES ON THE SEICHES IN LAKE

TRAVIS, TEXAS,
Texas Univ., Austin. Applied Research Labs.
G. E. Ellis, J. A. Shooter, and C. W. Horton, Sr.
Limnology and Oceanography, Vol 18, No 3, p
476-482, May 1973. 9 fig, 12 ref.

Descriptors: *Seiches, *Lakes, *Texas, Waves (Water), Winds, Storms. Identifiers: *Lake Travis (Tex).

Experimental observations of the seiches in a branch of Lake Travis were made before and after passage of several weather disturbances. Power passage of several weather disturbances. Power spectra present the changes in energy density occurring with the passage of a squall line, a fast moving cold front, and steady winds. Squall lines and fast moving cold fronts act as short impulses of energy for the seiche activity in Lake Travis. A duration of 60 sec was found for the impulse associated with the squall line. The duration for the fast moving cold front was less than 30 sec. The spectral lines of the seiche activity are highly developed, as one would expect, after steady northwest winds and also on a very calm summer day. (Knapr-USGS) day. (Knapp-USGS) W73-13060

POSTDEPOSITIONAL OSMOTIC ADJUST-MENTS IN SEDIMENTS FROM SOAP LAKE.

WASHINGTON,
Duke Univ., Durham, N.C. Dept. of Zoology.
For primary bibliographic entry see Field 02J.
W73-13064

WATER RESOURCES DATA FOR TEXAS, 1972: PART 1, SURFACE WATER RECORDS.
Geological Survey, Austin, Tex. Water Resources

For primary bibliographic entry see Field 07C. W73-13069

AND DISTRIBUTION IN TWO ADJOINING LAKES IN SRINAGAR: I. MACROFLORA IN RELATION TO PHYTOPLANKTON, Jammu and Kashmir Univ. (India). Dept. of Bioscience. PHYTOPLANKTON POPULATION DYNAMICS Bioscience. S. Kant, and P. Kachroo.

Group 2H-Lakes

Proc Indian Natl Sci Acad Part B Biol Sci. Vol 37,

No 4, p 163-188, 1971. Illus.
Identifiers: Chlorophyta, Copepods, Diatoms, Dinoflagellates, "Distribution patterns, "Flora, "India, Lakes, Myxophycaee, "Phytoplankton, Seasonality, Srinagar, Temperature, Hydrogenion coccuntration."

Ecology of Phytoplankton with respect to their distribution at different depths of water and asdistribution at different depths of water and associated hydrobiological factors (viz, temperature of water and atmosphere, pH and water level) and macrovegetation were studied in 2 adjoining (Indian) lakes during 1968-69. Observations were recorded at 3 depths; surface, 1 m, and bottom. The phytoplankton show 3 peaks; Mar-April, July-Aug. and Oct.-Nov. Of these, the organisms showed 3 patterns; the diatom-dinoflagellate peak, the copepod peak, and the peak of varied phytoplankton and high zooplankton. Dominance of algae was in the order; Diatoms Chlorophyceae and Myxophyceae. A census of algae revealed about 100 genera and their frequency was determined. Distribution of algae in relation to dominant macroflora is given.—Copyright 1973, Biological Abstracts, Inc. W73-13096

THE VERTICAL DISTRIBUTION OF SOME CILIATED PROTOZOA IN THE PLANKTON OF A EUTROPHIC POND DURING SUMMER

STRATIFICATION, Durham Univ. (England). Dept. of Bota For primary bibliographic entry see Field 05C. W73-13101

UTILIZATION OF THE CRAYFISH OR-CONECTES LIMOSUS AS FORAGE BY WHITE PERCH (MORONE AMERICANA) IN A MAINE

LAKE, Maine Cooperative Fishery Unit, Orono.

Trans Am Fish Soc. Vol 101, No 4, p 608-612. 1972. Illus.

Identifiers: *Crayfish, Forage, Insects, Lakes, *Maine, Morone-Americana, Orco Limosus, Osmerus-Mordax, *White perch. Orconectes-

White perch (Morone americana) under 201 mm long from a lake containing the crayfish Or-conectes limosus ate mostly insects. Perch from 201 to 280 mm long fed upon insects, fish, and crayfish. White perch over 280 mm fed mainly upon crayfish. Young-of-the-year O. limosus wer rarely utilized as forage by white perch. White perch under 201 mm long from a lake not having crayfish fed mostly upon insects but also ate fish. Perch over 200 mm long were almost exclusively piscivorous, the main forage fish being the rain-bow smelt (Osmerus mordax).—Copyright 1973, Biological Abstracts, Inc. W73-13106

EPIDEMIOLOGICAL STUDY ON CLONORCHIS SINENSIS AROUND LAKE BIWA, SHIGA PREFECTURE: II. SURVEY ON METACERCARIA INFECTION IN FRESHWATER FISHES AND ON HUMAN INFECTION WITH THIS PARASITE, (IN JAPANESE), Kyoto Prefectural Univ. of Medicine (Japan). Dept. of Medical Zoology. For primary bibliographic entry see Field 05C. W73-13112

A COMPARISON OF THE ZOOPLANKTON COMMUNITIES IN SEVEN MOUNTAIN LAKES NEAR LILLEHAMMER, NORWAY (1896 AND

1971), Norsk Institutt for Vannforskning, Blinden For primary bibliographic entry see Field 05C. W73-13117 EFFECTS OF DDT UPON SALMON FROM SCHOODIC LAKE, MAINE, Maine Dept. of Inland Fisheries and Game, Au-

For primary bibliographic entry see Field 05C. W73-13120

GONAD MATURATION OF BROOK TROUT (SALVELINUS FONTINALIS) IN A HIGH MOUNTAIN LAKE UNDER A MODIFIED

PHOTOPERIOD, Oregon State Univ., Corvallis. Dept. of Fisheries and Wildlife. G. L. Larson

J Fish Res Board Can. Vol 29, No 8, p 1209-1211.

Identifiers: *Brook trout, *Gonad maturation, Lakes, *Photoperiod, Salvelinus-Fontinalis, Trout, *Oregon (Pratt Lake).

Gonad maturation of brook trout (S. fontinalis) in Pratt Lake appeared similar to those reported for other areas although the day-length cycle was greatly modified by snow cover that capped the lake until early summer.—Copyright 1973, Biological Abstracts, Inc.
W73-13128

MODELLING THE REGULATION OF LAKE SUPERIOR UNDER UNCERTAINTY OF FU-TURE WATER SUPPLIES, Sun Oil Co., Dallas, Tex. For primary bibliographic entry see Field 04A. W73-13140

GLUCOSE FLUX AT THE SEDIMENT-WATER INTERFACE OF TORONTO HARBOUR, LAKE ONTARIO, WITH REFERENCE TO POLLUTION STRESS,

Toronto Univ. (Ontario). Dept. of Zoology. For primary bibliographic entry see Field 05B. W73-13236

THE DETERMINATION OF ALL DETECTABLE ELEMENTS IN THE AQUATIC PLANTS OF LINSLEY POND AND CEDAR LAKE (NORTH BRADFORD, CONNECTICUT) BY X-RAY EMISSION AND OPTICAL EMISSION SPECTROSCORY.

TROSCOPY,
Pittsburgh Univ. Pa. Dept. of Biology.
For primary bibliographic entry see Field 05A.
W73-13261

DISTRIBUTION AND BACKGROUND LEVELS OF MERCURY IN SEDIMENT CORES FROM SELECTED WISCONSIN LAKES, Wisconsin Univ., Madison, Dept. of Soil Science. For primary bibliographic entry see Field 05B. W73-1326E

METHYLMERCURY: BACTERIAL DEGRADA-TION IN LAKE SEDIMENTS, Midwest Research Inst., Kansas City, Mo. For primary bibliographic entry see Field 05B. W73-13267

SULPHATE DEPOSITION BY PRECIPITATION INTO LAKE ONTARIO, Atmospheric Environment Service, Toronto (Ontario). For primary bibliographic entry see Field 05B. W73-13270

NETWORK DENSITY OF TEMPERATURE PROFILE STATIONS AND ITS INFLUENCE ON THE ACCURACY OF LAKE EVAPORATION CALCULATIONS,
Oklahoma State Univ., Stillwater. Dept. of
Agricultural Engineering.
For primary bibliographic entry see Field 02D.

W73-13365

ECOLOGIC OBSERVATIONS ON THE HYDRO-PHILIC VEGETATION OF A SMALL LAKE OF MOUNT FUMAIOLO (APENNINES OF ROMAGNA), (IN ITALIAN), Florence Univ. (Italy). M. Raffaelli.

Identifiers: Clyzophytes, Ecologic studies, Hap-tophytes, *Hydrophilic vegetation, *Italy, Lakes, Rhizophytes, Spongophytes, Vegetation, Water

The ecological conditions of the vegetation of a lit-tle lake, situated on the Tyrrhenian side of Monte Fumaiolo (Appennino Ramagnolo, Italy), were examined. According to the conditions of the en-vironment (soil covered with shallow water, marshy or only damp, possible presence of a water current, seasonal variation of the water level) 3 current, seasonal variation of the water level) 3 different areas of vegetation, which correspond to as many aspects, have been distinguished: central area, intermediate zone and marginal zone. The latter has subsequently been divided into an outer peripheric belt and some more internal areas (water conveyors). The vegetation of each single zone was then examined, pointing out the life forms and their adaptiveness to the different hyperic conficient. Chrombutes revenil in the cenforms and their adaptiveness to the different hygric conditions. Clyzophytes prevail in the central and intermediate areas, with a considerable amount of haptophytes and rhizophytes; while spongophytes are scarce. On the marginal zone (outer belt and water conveyors) spongophytes are predominant, clyzophytes are scarce, and water plants are completely absent.—Copyright 1973, Biological Abstracts, Inc. 1973, 1930.

PARASITE FAUNA AND SEASONAL CON-TAMINATION OF COREGONUS LAVARETIS IN LAKE SEVAN, L. K. Vartanyan, and Z. A. Mkrtchyan. Biol Zh Arm. Vol 25, No 4, p 67-71. 1972. Identifiers: Coregonus-Lavaretis, Fauna, Lakes, *Parasite fauna, Seasonal, *Lake Sevan (USSR).

Results obtained from experiments carried out during years 1970-71, in 4 different lakes are presented. A number of parasites affecting various parts of fish exists in these lakes. The size, the parts of fish exists in these lakes. The size, the seasonal preference, the percentage of parasitism and intensity of parasitism are described and discussed.--Copyright 1973, Biological Abstracts, Inc W73-13400

FRESHWATER VERTEBRATE AND INVER-TEBRATE ECOLOGY OF AMCHITKA ISLAND.
JULY 1, 1971-JUNE 30, 1972,
Utah State Univ., Logan.
For primary bibliographic entry see Field 05C.
W73-13406

WIND-SWEPT WATER SURFACE IN LABORA-TORY COOLED BY APPLYING HEAT, Naval Research Lab., Washington, D.C. A. H. Schooley. Journal of Marine Research, Vol 31, No 1, p 93-95,

Descriptors: *Laboratory tests, *Winds, *Radia-tion, *Water temperature, Data collections, Water, Heat, Air-water interfaces, Measurements, Evaluation, Heat balance, Temperature, Lakes, *Model studies.

In a 40 cm x 45 cm x 20 cm basin containing 16 cm of water an experiment was conducted which imof water an experiment was conducted which im-plies that there may be conditions on the sea where the surface may be warmer under a cloud shadow than in direct sunlight. Wind was directed across the surface of the water while heat from a 215 watt lamp was directed down on it. Measurements of water temperature, air temperature, not radiation water temperature, air temperature, net radiation,

and humidity were taken while the lamp was al-ternately switched on and off. When the lamp was on and all else was held constant the mean temperature of the near-surface water reached 21.1 C. When the lamp was off and all else was held constant the mean near-surface water temperature reached 21.9C. (Jerome - Vanderbilt) W73-13434

SEASONAL VARIATIONS IN THE ROTIFER POPULATION OF THE NATRC'S CONTAINING WATERS OF KANEM (CHAD), Office de la Recherche Scientifique et Technique

Outre-Mer, Paris (France). A. Iltis, and S. Biou-Duwat

Cah O R S T O M Ser Hydrobiol. Vol 5, No 2, p 101-112, 1971. Illus. English summary. Identifiers: *Chad (Kanem), *Natron, *Rotifers,

Four species of Rotatoria are found in natroned temporary ponds and permanent lakes of the Kanem (Chad). The most important densities of population are in the temporary ponds. A very dense phytoplankton with Oscillatoria platensis may be unfavorable to the Rotatoria populations Ionic concentration and temperature seem to play a preponderant part in the seasonal variations ob-served.--Copyright 1973, Biological Abstracts,

UPPER MISSISSIPPI COMPREHENSIVE BASIN STUDY, APPENDIX D-SURFACE WATER HYDROLOGY.
Army Engineer District, St. Paul, Minn.

For primary bibliographic entry see Field 06B.

CONSERVATION OF THE GREAT LAKES OF EAST AFRICA: A LESSON AND A WARNING, Freshwater Biological Association, Ambleside (England). G. Fryer.

Biol Conserv. Vol 4, No 4, p 256-262, 1972. Illus. Identifiers: *Africa (Great Lakes), Conservation, Evolution, Fishery management, Fish, Inver-tebrates, Lakes, Management, Water pollution.

The Great Lakes of East Africa are not only the repositories of the world's 3 richest lacustrine fish faunas but also harbor unique assemblages of invertebrates. A few of these animals are illustrated. These lakes are of immense scientific interest, not merely by virtue of their richness in species, nor even because so many species are endemic, but as field laboratories of evolution whose operations we have scarcely begun to understand. They are also natural resources of great value, being enor mous reservoirs of pure water, and the sites of mous reservoirs of pure water, and the sites of fisheries producing many thousands of tons of fish per annum. Evidence is presented which unequivocally indicates that, by virtue of their tropical location and hydrological regimes, these lakes are much more susceptible to the damaging influences of O2-demanding pollution than their temperate-zone counterparts, and that, should they become contaminated, their renewal times are so great that a virtually irreversible catastrophe is possible. Evidence of the mismanage-ment of the fisheries of Lake Victoria is also presented and the danger of further uninformed exploitation pointed out. Certain apparent remedies are shown to be highly dangerous. The technology of fishing has advanced more rapidly than scientific understanding of the extremely complex ecosystems involved.—Copyright 1973, Biological Abstracts, Inc.

ECONOMIC CRITERIA FOR DECISIONS ON PRESERVATION AND USE OF INLAND WET-LANDS IN MASSACHUSETTS, Massachusetts Univ., Amherst. Dept. of Agricultural and Food Economics. For primary bibliographic entry see Field 06B. W73-13518

THE SEASONAL CYCLE OF PHEOPIGMENTS IN LAKE ONTARIO WITH PARTICULAR EMPHASIS ON THE ROLE OF ZOOPLANK-

TON GRAZING, Department of the Environment, Burlington (On-Department of the Environment, Burlington tario). Centre for Inland Waters.
For primary bibliographic entry see Field 05C.
W73-13572

THE OCCURRENCE AND DISTRIBUTION OF MERCURY IN THE SEDIMENTS OF PETIT LAC (WESTERN LAKE GENEVA), Geneva Univ. (Switerzerland). Dept. of Geology. For primary bibliographic entry see Field 05B. W73-13588

MARSH CILIATES (PROTOZOA): MORPHOLOGY, ECOLOGY, SYSTEMATICS, New Hampshire Univ., Durham. Dept. of Zoolo-

gy. A. Borror.

Acta Protozool. Vol 10, No 1-5, p 29-72. 1972. Il-

Identifiers: Chlamydodon-Lynchelliformis,

*Ciliates, Ecology, Marshes, Morphology, New,
New Hampshire, Paranophrys-Magna, Protozoa,
Species, Systematics, *Tidal marshes, Trichotaxis-Pulchra, Trimyema-Pleurispirale, *New
Hampshire.

Over 100 spp. of ciliates occur in New Hampshire saltmarshes. Anatomy, behavior, autecology, and systematic position of 29 spp. are discussed, including previously described species of the genera Coleps, Colpoda, Condylostoma, Dysteria, Frontonia, Geleia, Histriculus, Litonotus, Mesodinium, Nassula, Oxytricha, Paralembus, Paramecium, Placus, Plagiopyla, Pleuronema, Prorodon, Sonderia, Strombidium, Trachelonema, Trochilioides and Uropedalium. Four new species are described in the genera Chlamydodon, Paranophrys, Trachotaxis, and Trimyema (C. lynchelliformis, P. magna, Trimyema pleurispirale, Trichotaxis pulchra). Two species are transferred from Pseidocohnilembus to Paralembus. This serves as a reference for determination Over 100 spp. of ciliates occur in New Hampshire bus. This serves as a reference for determination of interrelationships of these ciliates and associated environmental factors.—Copyright 1973, Biological Abstracts, Inc. W73-13591

OXIDATION REDUCTION POTENTIALS, OXYGEN CONCENTRATION AND OXYGEN UPTAKE OF PROFUNDAL SEDIMENTS IN A EUTROPHIC LAKE, Bedford Inst., Dartmouth (Nova Scotia). Marine Ecology Leb

For primary bibliographic entry see Field 05C. W73-13599

THE BIOLOGY OF THE WEST AFRICAN SHAD ETHMALOSA FIMBRIATA (BOWDICH)
IN THE LAGOS LAGOON, NIGERIA,
Lagos Univ. (Nigeria). School of Biological

Sciences.
S. O. Fagade, and C. I. O. Olaniyan.
J Fish Biol. Vol 4, No 4, p 519-533. 1972. Illus.
Identifiers: Biology, Distribution patterns,
Ethmalosa-Fimbriata, Lagoons, *Nigeria (Lagos
Lagoon), *Shad, Spawning, Fish populations.

The biology of the population of E. fimbriata occurring in the Lagos Lagoon was investigated. Three size groups, 35-69 mm (Yoyo), 70-169 mm

(Efolo) and 170 mm and above (Agbodo) occur in the lagoon and the spatial distribution of these size groups and the length frequency distribution of the species is given. The relationship between length weight, age and growth is discussed and the food and feeding intra-relationship of the size groups is shown. Information on the fecundity and possible spawning periods is discussed.—Copyright 1973, Biological Abstracts, Inc. W73-13600

PHYTOPLANKTON IN LAKES OF THE SULAK RIVER BASIN IN DAGESTAN, (IN RUSSIAN), Laboratory of Limnology, Leningrad (USSR).

Bot Zh. Vol 56, No 11, p 1669-1674, 1971. Identifiers: Dagestan (USSR), Ecology, Lakes, *Phytoplankton, Rivers, Species, *Sulak River basin (USSR), *Algae.

Data are presented on the species composition, abundance and ecological characteristics of algae of some typical lakes in the basin of the Sulak River.—Copyright 1973, Biological Abstracts, Inc. W73-13606

CHARACTERISTICS OF DIATOMS OF PRESENT-DAY GLACIAL LAKES OF THE POLAR URALS, V. N. Stenin.

Biol Nauk. Vol 15, No 5, p 66-73, 1972. Identifiers: *Diatoms, Glacial lakes, Photosynthesis, Suppression, *Urals (USSR).

An analysis of 10 lakes of the polar Urals (USSR) showed that glacial lakes are poor in the composi-tion of diatoms. Mountain-valley lakes far from glaciers are distinguished by considerable develop-ment of diatoms. Some sediments of such lakes may be characterized as diatomites. The diatoms may be characterized as distomites. In equipment of glacial lakes are represented only by Arctic species; many species of the temperate zone are present, in addition to northern alpine diatoms, in the mountain-valley lakes. Freshwater-brackish water species are absent in glacial lakes, except for single ubiquists; in mountain-valley lakes, these diatoms are found rarely or singly. Truly elabetteric diatoms are almost completely about planktonic diatoms are found rarely or singly. Truly planktonic diatoms are almost completely absent in glacial lakes as a consequence c. uppression of photosynthetic activity in the turbic water.—Copy-right 1973, Biological Abstracts, Inc. W73-13613

NATURE OF THE BOTTOM AND DISTRIBU-TION OF BENTHIC ORGANISMS IN THE BOL REGION (EASTERN ARCHIPELAGO OF LAKE

REGION (EASTERN ARCHIF ELECTOR)
Office de la Recherche Scientifique et Technique
Outre-Mer, Fort-Lamy (Chad).
C. Dejoux, L. Lauzanne, and C. Leveque.
Cah O R S T O M Ser Hydrobiol. Vol 5, No 3/4, p
213-223, 1971. Illus. English summary.
Identifiers: Archipelago (Lakes), *Benthic organisms, Bottom, *Distribution patterns, Lakes, Mollusks, Oligochaeta, *Lake Chad.

The benthic organisms living in 5 different bottom deposits were sampled in a restricted area of the lake Chad eastern Archipelago. The analysis of the different samples shows that the granulometry of the bottom deposits plays an important part in the distribution of Oligochaeta and mollusks but a smaller part as far as insects are concerned. However, for these 3 groups, the originality of the ever, for these 3 groups, the originality of the populations living in the sandy bottom deposits is pointed out.—Copyright 1973, Biological Ab-W73-13618

STUDY OF THE BIOLOGY OF PELOPIA PUNC-TIPENNIS MG. (CHIRONOMIDAE, DIPTERA) IN THE MINGECHAUR RESERVOIR (IN RUS-

Group 2H-Lakes

Izv Akad Nauk Az SSR Ser Biol Nauk. 5/6, p 95-96, 1971. Identifia

e, 1711. Identifiers: Biology, *Chironomidae, *Diptera, *Mingechaur Reservoir (USSR), Pelopia-punc-tipennis, Reproduction, Reservoirs, Temperature, USSR.

In the Mingechaur reservoir (USSR), P. punctipennis produces 2 generations (April and Aug.). The females lay eggs within 50-65 hr at an air temperature of 12-16C. The number of eggs in each clutch varied from 400 to 680. The diameter of the clutches was 5.6-6.5 mm, the length of the eggs 0.35-4.0 mm, and the width 0.10-0.20 mm. The dentity of the layers excluded 680 layers of 25 section 1. sity of the larvae reached 680 larvae/m2 at a biomass of 0.40 g/m2.--Copyright 1973, Biological Abstracts, Inc. W73-13621

HYDROBIOLOGICAL INVESTIGATION OF LAKE LERE AND NEIGHBORING PONDS: II.

ROTIFERA, Office de la Recherche Scientifique et Technique Outre-Mer, Paris (France).

Cah O R S T O M Ser Hydrobiol, Vol 5, No 2, p

171-174, 1971. Identifiers: Distribution patterns, Hydrobiological studies, *Lake Lere (Chad), Ponds, *Rotifera.

Hydrobiological investigation of Lake Lere (Chad) Hydrobiological investigation of Lake Lere (Chad) and neighboring ponds revealed 14 species or subspecies of Brachionidae, 4 Lecanidae, 2 Notomatidae, 6 Trichocercidae, 3 Synchaetidae, 1 Asplanchnidae (Pseudotrocha); 5 Testudinellidae, 1 Conochilidae (Monimotrocha); and 1 Collothecidae (Collothecacea). Following special remarks on the form and size of Brachionus angularis, B. caudatus, Notommata sp., Trichocerca mucosa, and T. ruttneri, the distribution of rotifers found was discussed A comparison of the species found was discussed. A comparison of the species of Lake Lere and Lake Chad showed a similarity between the rotifer populations of these 2 lakes. Most of the forms of Lake Lere were cosmopolitan, and only 5 of them (less than 14%) were preferentially tropical or subtropical: Anuraeopsis coelata, Brachionus caudatus, Keratella tropica, Trichocerca ruttneri, and T. tchadiensis. All were species known for the African plankton populations taking into account certain confusions or possible synonomies such as Trichocerca similis and T. birostris.—Copyright 1973, Biological Abstracts. cal Abstracts, Inc. W73-13636

2I. Water in Plants

DETRITUS TO THE ENERGY REGIME OF DOE RUN, MEADE COUNTY, KENTUCKY, Louisville Univ., Ky. Water Resources Lab. For primary bibliographic entry see Field 05B. W73-13056 CONTRIBUTIONS OF ALLOCHTHONOUS

THE EFFECT OF WATER AND SALT FLUXES

THE EFFECT OF WATER AND SALT FLUXES ON THE TRANSROOT POTENTIAL IN HELIANTHUS ANNUUS, Atomic Energy Agricultural Research Center, Tando Jam (Pakistan).
A. Q. Ansari, and D. J. F. Bowling.
J Exp Bot. Vol 23, No 76, p 641-650. 1972. Illus. Identifiers: "Water Flux, Helianthus annuus, Ion transport, Roots, "Salt flux, "Sunflower roots.

The effect of an artifically imposed water flux on the trans-root electrical potential difference was studied in excised sunflower roots. The potential of the xylem sap became more negative with respect to the external medium as the rate of water flow was increased. This change appeared to be re-lated to an accompanying increase in the flux of ions. The effect of increasing the water flux on the vacuolar potential difference of the epidermal cells was also investigated. It also became more

negative with increasing water flux. Both potentials were measured simultaneously in the same root. On increasing the water flux it was found that the trans-root potential began to rise immediately but there was a time lag of approximately 2 min before the vacuolar potential began to change. The relevance of these potential changes to the mechanism and pathway of ion transport across the root is discussed.—Copyright 1973, Biological Abstracts. Inc. Abstracts, Inc. W73-13066

AN AQUARIUM TEMPERATURE CONTROL SYSTEM FOR FIELD STATIONS, New York Cooperative Fishery Unit, Ithaca. For primary bibliographic entry see Field 05C.

REACTIONS OF CANADA GEESE TO RESER-VOIR IMPOUNDMENT ON THE SNAKE RIVER IN WASHINGTON, Washington State Univ., Pullman, Dept. of Zoolo-

For primary bibliographic entry see Field 06G. W73-13082

PHYSIOLOGY OF DAILY TRANSPIRATION RHYTHM IN WOODY PLANTS, For primary bibliographic entry see Field 02D. W73-13095

NUTRIENT CONTENT OF LITTER FALL ON THE HUBBARD BROOK EXPERIMENTAL FOREST, NEW HAMPSHIRE,

New Mexico Univ., Albuquerque. Dept. of Biolo-

For primary bibliographic entry see Field 02K. W73-13100

EFFECT OF TEMPERATURES AND WATER TABLE DEPTH ON THE GROWTH OF CREEP-ING BENTGRASS ROOTS,
Purdue Univ., Lafayette, Ind. Dept. of Agronomy.
D. S. Ralston, and W. H. Daniel.

D. S. Kalston, and W. H. Daniel.
Agron J. Vol 64, No 6, p 709-713. 1972. Illus.
Identifiers: Agrostis-palustris, *Bentgrass roots,
Dew, *Grass growth, Infiltration patterns, Porosity, Roots, Sand, Size, *Temperatures, *Water
table depth.

The PURR-WICK system provides an impermea-ble underlay, plus possible retention of free water by outflow drainage control. The effect in this system of sand texture, depth of water reserve and temperature was studied. 'Penncross' bentgrass (Agrostis palustris Huds.) was grown in columns of finer and coarser sand mixes with water tables maintained at depths of 11, 25 and 40 cm in conmaintained at depths of 11, 22 and 40 cm in con-stant temperature chambers of 15 and 30C for 9 wk. Temperature had the greatest effect. At 15C root growth was slow initially but steadily main-tained. At 30C initial root growth was rapid but declined to little or no growth, so that total root length at 15C was 3 times that for 30C. Within each rengerate 15c was sumes that for 5cc. Within each temperature the water table X sand interaction was significant. Root growth was better in the finer sand for the 40-cm treatment. Deepest root growth was found at 15C in the finer sand mix with the water table at 40 cm. Where O2 diffusion was favored by coarse texture, roots were still limited by higher temperature.—Copyright 1973, Biologi-cal Abstracts, Inc.

SOME ECOLOGICAL RELATIONSHIPS OF THE INVERTEBRATE DRIFT IN PRATERS CREEK, PICKENS COUNTY, SOUTH PICKENS

CREEK, PICKENS COUNTY, SO CAROLINA, Oklahoma Univ., Norman. Dept. of Zoology. W. K. Reisen, and R. Prins. Ecology. Vol 53, No 5, p 876-884. 1972, Illus.

Identifiers: Biomass, Creek, Density, Dependence, Drift, Ecological studies, Ephemerella-Sp,
*Invertebrate drift, Praters, Relationships, *South
Carolina (Praters Creek).

The role of organic drift in the ecology of a southern, upper Piedmont stream was evaluated from Sept. 1967 to Aug. 1968. By sampling for a 24-hr period each mo., data on the diel and monthly fluctuations of the drift were obtained. Chemical and physical analyses of the water were made to evaluate the role of selected abiotic variamade to evaluate the role of selected abiotic varia-bles in the ecology of the drifters. Community biomass could not be estimated by drift because fluctuations in the standing crop were not signifi-cantly correlated with fluctuations in the drift rate. With the exception of Ephemerella sp. the drifters did not respond in a density-dependent fashion to benthic population increases. Drift seemed to be initiated by pupation or emergence activity. The diel drift for the majority of the benthos examined was decidely negatively photoactic. Propounced was decidely negatively photoactic. Pronounced crepuscular activity was observed for most of the hemimetabolous forms with a consistent midnight epression of activity.--Copyright 1973, Biological Abstracts, Inc. W73-13107

ROOT DISTRIBUTION AND SOIL MOISTURE STUDIES IN SOME PERENNIAL RYEGRASS AND PHALARIS PASTURES ON SOUTHERN TABLELANDS, SOUTH-EASTERN TRALIA,

TRALIA, Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Plant Industry. E. W. Pook, and A. B. Costin. Aust C S I R O Field Stn Rec. Vol 10, No 2, p 59-

72. 1971. Illus.

Identifiers: *Australia, Clover, Grass, Lolium-Perenne, Pastures, Perennial, *Phalaris, *Root systems, *Rye grass, Soils, *Soil moisture, Sub-terranean, Tablelands.

Quantitative assessments were made of the dis-tribution of perennial ryegrass (Lolium perenne L.) and phalaris (Phalaris tuberosa L.) root systems developed in typical perennial pastures in-tensively grazed by sheep on the Southern Table-lands of New South Wales and the Australian Capital Territory. At Wollogorang, near Goulburn, dominant perennial ryegrass was found to have su-perficial development of roots, with virtually full exploration of topsoil, but limited vertical extenson of roots into subsoil. In sown pastures on the southern tablelands shallow-rooted species such as perennial ryegrass were seriously affected by the dry soil conditions experienced between 1965 as perennal ryegrass were senously attected by the dry soil conditions experienced between 1965 and 1968. In phalaris-subterranean clover pastures at Ginninderra, near Canberra, phalaris roots did not fully exploit the topsoil, but in contrast to perennial ryegrass were found to have strong ver-tical extension of deep roots in subsoil. The surucal extension of deep roots in subsoil. The survival value of the deep root system of phalaris during prolonged droughts was borne out by soil moisture measurements. There was pronounced drying out of the soil profile within and beyond the apparent level of root extension; nevertheless, some available water remained in the deeper subsoils to which the phalaris roots had access.—Copyright 1973, Biological Abstracts, Inc. W73-13110

PRODUCTIVITY AND DISTRIBUTION OF TRICHOPTERA LARVAE IN A COLORADO MOUNTAIN STREAM, Southern Methodist Univ., Dallas, Tex. Dept. of

Biology.
J. O. Mecom.

Hydrobiologia. Vol 40, No 2, p 151-176. 1972. Illus. Identifiers: "Colorado (St. Vrain River), "Distribution patterns. Larvae, Mountain streams, "Productivity, Stream, Temperature, "Trichoptera

From June 1968 to late May 1969, collection of more than 20,600 immature Trichoptera were made from the St. Vrain River of Colorado. Agapetus sp., Arctopsyche grandis, Brachycentrus americanus, Ecclisomyia maculosa, Hydropsyche sp., H. occidentalis, Helicopsyche Hydropsyche sp., H. occidentalis, Helicopsyche borealis, Leptocella sp., Neothremma alica, Rhyacophila acropedes and Sortosa sp. were taken at 8 sites ranging from 1565 to 3200 m in altitude. The Trichoptera of the St. Vrain exhibited a distinct altitudinal zonation with Zone I (1565 m) dominated by Leptocella, Hydropsyche sp., and Helicopsyche borealis; Zone II (1750 to 2350 m) was dominated by Brachycentrus americanus and Hydropsyche occidentalis; Zone III (2350 m) was considered a transitional area. In Zone IV (2650 m) and Zone V (2950 to 3250 m) Neothremma alicia and Arcionsyche grandis were the most successful and Arctopsyche grandis were the most successful genera, respectively. Temperature is proposed as the major variable controlling altitudinal zonation. Standing crop productivity of Trichoptera was determined from timed collections and expressed as population density (number of operations of determined from timed collections and expressed as population density (number of organisms collected per 30 min) and organic biomass (dry organic matter represented by organisms collected per 30 min). Intermediate altitudes (2300 m) exhibited the lowest productivity but greatest species diversity. Highest productivity occurred below the period of the Trichoptera, temperature, and current seem to be the major governing factors of seasonal produc-tivity.—Copyright 1973, Biological Abstracts, Inc. W73-13124

TAXONOMIC GUIDES TO ARCTIC ZOOPLANKTON (V): PELAGIC POLYCHAETES OF THE CENTRAL ARCTIC

BASIN, University of Southern California, Los Angeles. Dept. of Biological Sciences. For primary bibliographic entry see Field 05A. W73-13233

APPARATUS FOR SEMI-CONTINUOUS CUL-TURE OF DAPHNIA, For primary bibliographic entry see Field 05A. W73-13239

HELMINTH PARASITES OF FOUR SPECIES OF SUNFISHES (CENTRARCHIDAE) FROM LAKE WILGREEN IN KENTUCKY, Eastern Kentucky Univ., Richmond. Dept. of

Biological Sciences.
J. P. Harley, and T. L. Keefe.

J. P. Harley, and T. L. Keete.
Trans Ky Acad Sci. Vol 32, No 3/4, p 71-74.
Identifiers: Acanthocephala, Centrarchidae,
Cestoidea, Digenea, "Helminth, "Kentucky (Lake
Wilgreen), Lakes, Lepomis-Cyanellus, LepomisMacrochirus, Lepomis-Megalotis, LepomisMicrolophus, Monogene", Nematoda, "Parasites,
Species, Sunfishes.

Lepomis cyanellus, L. megalotis, L. macrochirus and L. microlophus were examined for parasites. and L. microlophus were examined for parasites. Acanthocephala, Cestodidea, Digenea, Monogenea and Nematoda were represented among the 15 spp. of helminths found parasitizing the fish. All the reported helminths constitute new range extension records.—Copyright 1973, Biological Abstracts Jose W73-13268

EFFECT OF PLANT MOISTURE STRESS ON CARBOHYDRATE AND NITROGEN CONTENT

OF BIG SAGEBRUSH, Utah Univ., Salt Lake City. Dept. of Biology. S. J. Dina, and L. G. Klikoff.

Journal of Range Management, Vol 207-209, May 1973. 2 fig. 1 tab, 25 ref. nt, Vol 26, No 3, p

Descriptors: *Moisture stress, *Carbohydrates, *Nitrogen, *Sagebrush, *Utah, Consumptive use, Grazing, Range management, On-site investiga-tions, Livestock. tifiers: *Red Butte Canyon (Utah).

Plants were selected from Red Butte Canyon, east of Salt Lake City, Utah, to delineate the effects of plant moisture stress on carbohydrate and nitrogen plant moisture stress on carbohydrate and nitrogen content of important range species. Proper management of grazing intensity on summer ranges, when high plant water stress conditions exist, is needed. Water potential of big sagebrush shows great seasonal variation, ranging from a low of -70.3 bars in September to a high of -8.3 bars in April. Starch content remained fairly consistent in water stressed plants, although sugar content significantly increased in leaves, stem and roots. Leaf nitrogen content significantly decreased in nticantly increased in leaves, stem and roots. Leaf nitrogen content significantly decreased in water stressed plants, while stem nitrogen content significantly increased. Overgrazing during summer range conditions, when plant water stress is likely high, could be detrimental since much of the stored nitrogen and carbohydrate would be removed and range quality could therefore be adversely affected. (Bahre-Arizona) W73-13309

THE PLANT ECOLOGY OF UTAH'S DESERT

RANGELANDS, Utah State Univ., Logan. Dept. of Range Science. M. M. Caldwell, and N. E. West. Utah Science, p 14-15, March 1972. 1 fig.

Descriptors: *Ecology, *Invasion, *Succession, *Deserts, *Forage grasses, *Utah, Desert plants, Livestock, Forage palatability, Grasses, Snow cover, Water supply, Distribution patterns, Moisture availability. Identifiers: Winterfat, Dropseed, Shadscale, Greasewood, Halogeton, Russian thistle.

Utah's desert rangeland comprises 45 percent of the total land area and is an important source of forage for much of Utah's livestock industry, par-ticularly during the winter months. Overgrazing, prior to the 1930's, severely reduced the more prior to the 1930's, severely reduced the more palatable plant species such as winterfat and drop-seed grasses, while such species as shadscale, greasewood, halogeton and Russian thistle have become increasingly prominent. Snow provides much of the moisture, although it is unevenly dis-tributed by strong winds. Snow surveys indicate that taller desert shrubs such as sagebrush and shadscale act as effective snow traps, while areas covered with lower growing plants are often blown clean of any snow cover. This water supply dis-tribution is one factor in favor of the success of less desirable shrubs. (Bahre-Arizona)

PRAIRIE SANDREED (CALAMOVILFA LON-GIFOLIA): WATER INFILTRATION AND USE,

Agricultural Research Service, Sidney, Mont. J. K. Aase, and J. R. Wight. Journal of Range Management, Vol 26, No 3, p 212-214, May 1973. 2 fig. ! tab, 8 ref.

Descriptors: *Soil-water-plant relationships, *Forage grasses, *Consumptive use, *Infiltration rates, Soil water, Growth rates, Environmental effects, Runoff, Grazing, Range management, Soil texture, On-site investigation.
Identifiers: Great plains.

Prairie sandreed grows in nearly pure stands, resulting in distinct boundaries between the sandreed colonies and surrounding vegetation. Because of the distinct growth pattern of the forage species, an investigation of possible diferences from the adjacent mixed prairie vegetation, particularly in soil profile and texture and

water infiltration and water-use patterns, was conducted. Results of infiltration runs indicated that antecedent soil water in the top 30 cm of soil had no measurable effect on the relative infiltration rates. A comparison of rates on undisturbed prairie sandreed averaged four times higher than on undisturbed surrounding vegetation. When vegetation was clipped to soil surface, soil under prairie sandreed showed a significantly higher intake rate. When top 3 cm of soil was removed, infiltration was greatly reduced on both areas. The greater infiltration rate in prairie sandreed colonies causes vigorous growth. Results demonstrate the important role both living plants and litter play in the water budget of a plant community. Snow catch and water infiltration were increased by increasing plant cover. Determination of optimum grazing intensities should include not only the effects of foliage removal on the growth and survival no measurable effect on the relative infiltration grazing intensities should include not only the ef-fects of foliage removal on the growth and survival of plants, but also the maintenance of an adequate plant cover. (Bahre-Arizona) W73-13312

RESPONSES OF SEMIDESERT GRASSES TO

SEASONAL REST, Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station For primary bibliographic entry see Field 04A. W73-13318

METHODS FOR SEEDING THREE PERENNIAL WHEATGRASSES ON CHEATGRASS RANGES IN SOUTHERN IDAHO, Agricultural Research Service, Reno, Nev. Plant

Science Research Div.
For primary bibliographic entry see Field 04A.
W73-13319

TERRESTRIAL PLANT ECOLOGY.

Battelle-Pacific Northwest Labs., Richland, Wash. Ecosystems Dept. For primary bibliographic entry see Field 05B. W73-13340

DEW: AN ADDITION TO THE HYDROLOGIC

BALANCE OF DOUGLAS FIR, Washington Univ., Seattle. Coll. of Forest

L. J. Fritschen, and P. Doraiswamy.
Water Resources Research, Vol 9, No 4, p 891-894, August 1973. 1 fig, 1 tab, 5 ref. NSF Grant GB20963.

Descriptors: *Water balance, *Hydrologic budget, *Douglas fir trees, *Dew, Evapotranspiration, Forests, Meteorology.

The hydrologic balance of a 28-meter Douglas fir tree in a weighing lysimeter was determined for 2 clear days in May 1972. Dew accumulations were 6.4 and 10.9 liters, which represent 15% and 20% of the 42.5 and 55.2 liters of evaporation from the tree. In the Pacific Northwest conditions are favorable for dew formation during most of the summer and fall. Thus dew formation could represent a large part of the hydrologic balance of fir forests. (Knapp-USGS) W73-13366

STUDIES OF LANDSCAPE ECOLOGY OF THE NATURAL PROTECTION AREA 'ENTENFANG' NEAR WESSELING,

G. Bauer. Decheniana. Vol 123, No 1/2, p 165-198. 1970

(1971). Illus. Identifiers: Anas-Querquedula, *Landscape ecology, *Biotopes, Charadrius-Dubius, Chettusia-Gregaria, Coturnix-Coturnix, Ixobrychus-Minutus, Podiceps-Ruficollis, Saxicola-Torquata, *Germany (Wesseling).

Group 21-Water in Plants

The 'Entenfang' near Wesseling (West Germany) is located on an old bed of the Rhine. The diversity of the biotope is due to the food-rich waters, its position in a steppe-like open field landscape, the brief changes in water level, the wide areas of flat bank and the extensive reed stands. Nearby meadows and woodlands provide 'Entenfang' with the their biotopes with twicel belant and arrivals. meadows and woodlands provide 'Entenfang' with further biotopes with typical plants and animals. The reed zone consists predominantly of the relatively rare Accretum calami Schulz 40. The Typetum angustifolio-faitfoliae (Egg. 33; Schmale 39) also occurs. The Lemnetum gibbae Mijaw. et J. Tx. 60 occurs occasionally in the small still water bays. The flat banks are covered by the nitrophilous summer annual association of Bedention tripartiti Nordh. 40 and by Rannuculetum scelerati Siss. 46, Tx. 50. Meadows of this area belong to the Arrenatherum type and occur in fresher scelerati Siss. 46, Tx. 50. Meadows of this area belong to the Arrenatherum type and occur in fresher
or drier associations depending on location. This
area is rich in birds including 5 Podicipedidae species, 14 Anatidae species, 28 Liminicole species, 5
Laridae species, 3 Sternidae species and 5 Rallidae
species. A number of birds rare to the Rhineland
occur in this area. Chettusia gregaria was observed
once in 1969. Ixobrychus minutus, Saxicola
torquata, Podiceps ruficolis, Anas querquedula,
Coturnix coturnix and Charadrius dubius are rare
preeding birds. Plans for the maintenance and use breeding birds. Plans for the maintenance and use of the area are presented.—Copyright 1973, Biological Abstracts, Inc. W73-13388

STRUCTURE AND PROPERTIES OF WATER AND THEIR SIGNIFICANCE FOR BIOLOGI-CAL SYSTEMS, (IN CZECH), Ceskoslovenska Akademia Ved, Prague. Inst. of

Microbiology.

Biol Listy. Vol 37, No 2, p 98-112. 1972. Illus. En-

glish summary. Identifiers: *Biological systems, Chemistry, Organisms, *Water properties, *Water structure

Water, the universal medium for the overwhelming majority of biological processes, is frequently considered by practicing biologists as an inert solvent which does not significantly affect the processes in biological systems and the properties of which can be disregarded. Recently, evidence was accumulated that, on the contrary, water is one of the most important factors in a number of complicated chemical reactions, making the existence of living matter possible. The data presented represent but a fraction of the experimental material available on water and its properties which accrued from intensive research carried out recently in the field.--Copyright 1973, Biological Abstracts, Inc. W73-13392

ON THE SIGNIFICANCE OF ANTITRANS-PIRANTS FOR TROPICAL CULTIVATED PLANTS, (IN GERMAN), Giessen Univ. (West Germany). Lehrstuhl Botank

(II). For primary bibliographic entry see Field 02D. W73-13394

DATA ON THE WATER BALANCE OF SOME XEROTHERMIC TERRESTRIAL LICHENS, National Museum of Natural History, Budapest (Hungary).

K. Verseghy. Ann Hist Nat Mus Natl Hung. 63, p 83-97. 1971. Il-

nus. Identifiers: Cladonia-Convoluta, Cladonia-Fur-cata, Cladonia-Magyarica, Humidity, *Lichens, Parmelia-Pokornyi, *Xerothermic lichens, *Water balance, *Relative humidity.

The water uptake and release of Cladonia magyarica, C. furcata, C. convoluta and Parmelia pokor-nyi in water and water vapor at different relative humidities was different in each species. The amount of water uptake was dependent on the structure of the thallus or podetium. The amount of water absorbed or emitted was linearly corre-lated with the thickness of the upper and lower lated with the thickness of the upper and lower cortical layers. The entrance of water was inhibited by the gonidia layer and the acid crystals. At 70, 80 and 95% relative humidity, the water content of the lichens increased 12-14%. At 100° relative humidity the water content reached 60-70% in C. furcata, and 45-50% in the remaining species. Under standard conditions a water equilibrium occurred (within 1-2 min for water and several days for water vapor).—Copyright 1973, Biological Abstracts, Inc. W73-13397

PLANT ACCUMULATIONS OF RADIOACTIVE STRONTIUM WITH SPECIAL REFERENCE TO THE STRONTIUM-CALCIUM RELATIONSHIP

THE STRUNTIUM-CALCIUM RELATIONSHIP AS INFLUENCED BY NITROGEN, Danish Atomic Energy Commission, Risoe. Research Establishment. For primary bibliographic entry see Field 05B. W73-13418

THE IMPORTANCE OF DISCOVERIES IN NE-MATOLOGY TO HUMAN WELFARE.

Bioscience. Vol 22, No 4, p 237-239. 1972. Identifiers: Animals, Human health, *Nematology, *Ecological balance, Parasites.

Nematodes are a widespread and extremely important group of animals. The parasitic forms are important in the health of man and animals and in theefficiency of agriculture. The free-living forms are known to be present in enormous numbers in soil and fresh water, and undoubtedly have major roles in maintaining the natural ecological balance.
The role of the marine forms is almost entirely unexplored. Traditionally nematology has been partitioned into functional categories (e.g., animal parasites, plant parasites and free-living terrestrial and aquatic). Now researchers are moving from narrow specialities to broadly based ecological and chemical studies.—Copyright 1973, Biological Abstracts. Inc.

FRESHWATER DIATOMS IN THAILAND, For primary bibliographic entry see Field 05A. W73-13570

WATER RESERVE OF LEAVES OF DESERT-STEPPE AND INTRODUCED PLANTS IN THE GOBI DESERT OF MONGOLIA, (IN RUSSIAN), Akademiya Nauk SSSR, Leningrad. Botanicheskii Institut

Ekologiya. Vol 3, No 1, p 37-44. 1972. Illus. Identifiers: *Desert plants, *Gobi Desert, Leaves, Moisture, *Mongolia, Soil, Steppes, Water storage

Information is presented on the water reserve of leaves and daytime dynamics of the water content in leaves of plants of the Gobi desert-steppe zone of Mongolia growing under different soil moisture conditions. The water reserve of leaves was studied in plains habitats, on the talus of the Gobi Altai and in its gorges, in local and introduced species of woody, fruticose and herbaceous plants.—Copyright 1973, Biological Abstracts, Inc.) W73-13574

STATE OF PLASTID PIGMENTS IN LEAVES OF ESSENTIAL-OIL-BEARING PLANTS UNDER DIFFERENT WATER SUPPLIES, (IN

RUSSIAN),
Krymskii Gosudarstvennyi Pedagogicheskii Institut, Simferopol (USSR).
M. V. Sivtsev, G. Ya. Karpova, and G. G.

Fiziol Biokhim Kul't Rast. Vol 4, No 4, p 390-395. 1972. Illus. (English summary).

1972. Illus. (Engusn summary). Identifiers: *Leaves, Mentha-Piperita, Moisture, Pigments, *Plastid pigments, Reproduction, Sal-via-Sclarea, Soils, Water supply.

The content of water, chlorophyll and carotenoids The content of water, chlorophyll and carotenoids was determined in leaves of Salvius sclarea L. and Mertha piperita Huds. grown under conditions of constant and variable soil moisture in the reproductive period. The water supply under low soil moisture conditions was unchanged in leaves of S. sclarea, but decreased in M. piperita. Increased pigment formation was observed with low soil moisture, while variations in piement content. soil moisture, while variations in pigment content were found with variable moisture. A positive correlation was observed between the content of chlorophyll a and essential oil in leaves of the essential-oil-bearing plants.--Copyright 1973, Biological Abstracts, Inc. W73-13575

WATER-HOLDING CAPACITY OF PLANT TISSUES, (IN RUSSIAN),
For primary bibliographic entry see Field 03F.
W73-13576 COMPLEX CHARACTERISTICS OF THE

ANCYROCEPHALUS DYKI N. SP. (MONOGE-NOIDEA: DACTYLOGYRIDAE) ON THE GILLS OF LEBISTES RETICULATUS, Vvsoka Skola Veterinarni,

zechoslovakia). Dept. of Parasitology and Invasive

Acta Vet. Vol 14, No 1, p 13-18. 1972. Illus. Identifiers: Ancyrocephalus-Dyki, Dactylo-gyridae, Gills, *Lebistes-Reticulatus, *Monogedea, Species

A new species of monogenetic fasciolae of the Ancyrocephalus family was ascertained on the gills of cyrocephalus family was ascertained on the gills of aquarium fish (Lebistes reticulatus) from aquariums of breeders from Brno. The marginal hooks of haptor of embryonal type measured 0.0007-0.012 mm, the over-all length of the dorsal central hooks reached 0.020-0.023 mm, the dimensions of their connecting plates 0.004-0.005 x 0.023-0.026 mm. The ventrally central hooks measured 0.018-0.026 mm and their connecting plates, 0.004-0.005 x 0.021-0.026 mm. The copulative organs are represented by a 3-fold spiral twisted copulative represented by a 3-told spiral twisted copulative tube and indistinct membran-like supporting organs. The chitin vaginal stiffening is 0.027-0.040 mm long. The monogenetic fasciolae were termed A. dyki.—Copyright 1973, Biological Abstracts, Inc. W73-13589

ASPINA TRIUM GALLIENI N. SP. (MONOGENA, POLYOPISTHOCOTYLEA) PARASITE OF STRONGYLURA ACUS

(MONOGENA, POLYOPISTHOCOTYLEA)
PARASITE OF STRONGYLURA ACUS
LACEPEDE 1803, (IN FRENCH),
Montpellier Univ. (France). Laboratoire de
Parasitologie Comparee.occtylea) Parasite of
Strongylura Acus Lacepede 1803, (In French),
L. Euzet, and M. H. Ktari.
Bull Soc Zool Fr. Vol 96, No 4, p 509-517. 1971. Il-

lus. English summary.

Identifiers: Aspinatrium-Gallieni, *Monogenea.

*Parasites, Polyopisthocotylea, Species, *Strongylura-Acus.

A new species of Microcotylidae (Monogenea) is described (A. gallieni). The parasite lives on the in-ternal side of the gill cover of the Strongylura acus. The clinated gyrodactyloid larva looks like that of many Microcotylidae. Cysts, one of which clearly contained a metaceracria, were found in the body of this Monogenea.—Copyright 1973, Biological Abstracts, Inc. W73-13590 THE HIPPOPHAE RHAMNOIDES ALLUVIAL FOREST AT LEINORA, CENTRAL NORWAY: A PHYTOSOCIOLOGICAL AND ECOLOGICAL

Bergen Univ. (Norway). Botanical Museum. A. Skogen. K Nor Vidensk Selsk Skr. 4, p 1-115. 1972. Illus. Identifiers: *Alluvial forests, Calcium, Ecological studies, *Forests, Hippophae-Rhamnoides, Light, *Norway, Phytosociological studies, Salinity, Soils, Hydrogen ion concentration.

The biology, distribution and autecology of H. rhamnoides, and the phytosociology and synecology of the extensive Hippophae thickets in the Gaula estuary are treated. Irrespective of the start-Gaula estuary are treased. Interpolation develops into a paraclimax of dense Hippophae scrubs rich in nitrophilous species. After 50-70 yr Hippophae dies, causing disintegration of the community and finally a complete denudation of the banks, after which reestablishment occurs. Light conditions in the control of the banks after which reestablishment occurs. Light conditions in the control of the banks after which reestablishment occurs. side the thickets and the N supplied by Hippophae are decisive successional factors. Salinity, pH and Ca content of the soil are of minor importance. The very rich epiphytic flora of Hippophae is described.--Copyright 1973, Biological Abstracts,

EFFECT OF AWNS AND DROUGHT ON THE SUPPLY OF PHOTOSYNTHATE AND ITS DISTRIBUTION WITHIN WHEAT EARS, Commonwealth Scientific and Industrial Research

Organization, Canberra (Australia). Div. of Plant Industry.

nary bibliographic entry see Field 03F. W73-13595

FIRST DATA ON THE WATER REGIME OF PLANTS FROM SOUTHERN MONGOLIA. (IN

Akademiya Nauk SSSR, Leningrad. Botanicheskii

V. M. Sveshnikova, N. I. Bobrovskaya, and B. Choizhamts

Bot Zh. Vol 56, No 12, p 1797-1805, 1971. Illus. Identifiers: "Absorption, Allium-Polyrrhizum, Ar-temisia-frigida, Brachanthemum-gobidum, Deserts, Eurotia-ceratoides, Haloxylon-ammodendron, *Mongolia, Reaumuria-soongorica, Salsola-passerina, *Steppes plants, Stipa-gobica, Stomata, *Transpiration, Zygophyllum-Xanthox-

The intensity of transpiration, the water content and the amplitude of changes in the water content in leaves, the absorption power of leaves and stomata movement were compared in plants from the steppes (Stipa gobica, Artemisia frigida, Allium polyrrhizum and Eurotia ceratoides) and from desert regions (Reaumuria soongorica, Brachanthemum gobicum, Salsola passerina, Zygophyllum xanthoxylon and Haloxylon am-modendron).—Copyright 1973, Biological Abstracts, Inc. W73-13607

CHANGES IN SPECIES COMPOSITION OF NITROPHILOUS EDGE ASSOCIATIONS IN STUDENY AND ROHACSKY VALLEYS IN THE STUDENT AND ALLIPTAUER TATRA,
Carboelovenska Akademie Ved, Prague.

Botanicky Ustav.

K. Kopecky. Preslia (Praha). Vol 43, No 4, p 344-365, 1971. Il-

Identifiers: Aegopodium-podagraria, Anthriscus-sylvestris, Armoracia-lapathifolia, Chaerophyl-lum-aromaticum, *Czechoslovakia (Liptauer Tara), *Nitrophilous edge associations, Rohacsky, Species, Studeny, Valleys.

Nitrophilous edge associations on the banks of the Studeny and Rohacsky brooks (Czechoslovakia) have undergone changes due to changing natural conditions at various elevations and due to the inconditions at various elevations and due to the influences of man. Changes in composition are
governed by the 1000 m difference in elevation
between spring and estuary together with climatic
and hydrological changes. The geographic habitat
of the subassociations Petasitetum officinalisglabrati chaerophylletosum aromatici, P. o.g. doronicetosum austriaci and Adenostyli-Athyrietum alpestris petasitetosum albae has not changed significantiy with the exception of the shift of the
first subassociation to higher elevations. Anthropic influences are noticeable especially in recreation areas and in settled areas. Some allochthonous species (Anthriscus sylvestris, Armoracia lapathifolia and others) appeared which
were never identified before in this area. The
habitat of other species (Aegopodium podagraris, were never identified betore in this area. The habitat of other species (Aegopodium podagraria, Chaerophyllum aromaticum and others) shifted to higher elevations beyond their original geographic location.—Copyright 1973, Biological Abstracts, W73-13608

AGE AND GROWTH OF THE 'RAINBOW TROUT' (SALMO GAIRDNERII IRIDEUS GIB-BONS 1855) LIVING IN THE WATER VALLEY RESERVOIR OF THE HNILEC VALLEY, (IN

CZECH), Slovenske Bratislava Polnohospodarske (Czechoslovakia). Akademie, Laboratorium

J. Holcik, and R. Zitnar Biologia (Bratisl). Vol 27, No 2, p 153-162, 1972. Il-lus. English summary. Identifiers: Age, *Czechoslovakia, Growth,

Identifiers: Age, *Czechoslovakia, Growth Hnilec, *Rainbow trout, Rate, Reservoirs, Salmo gairdneri-irideus, Sex, Trout.

The age composition, sex composition and growth of the rainbow trout, S. g. irideus in the Hnilec water valley reservoir (East Slovakia (Czechoslovakia), Tisa river basin) were studied. Differences were found in sex composition in 1966 and 1967, in growth rate in these years and between both sexes and increasing growth rate in comparison with that in 1964. Maximal age found was 6 yr which is considered the boundary age of this species in this locality. The higher age also here is attained by females. The growth rate in the Hnilec reservoir is very high in comparison with North American populations.—Copyright 1973, Biological Abstracts, Inc.

DISTRIBUTION, STRUCTURE AND TROPHIC RELATIONSHIPS OF THE FISH POPULATION OF THE UPPER COURSE OF THE MURESH RIVER, (IN RUMANIAN), Babes-Bolyai Univ., Cluj (Rumania). S. Gyurko, and Z. I. Nagy. Stud Cercet Piscic Inst Cercet Project Aliment. No 4, p 311-348, 1971. Illus.

entifiers: Age, Alburnoides-bipunctatus, Albur-Identifiers: Age, Alburnoides-bipunctatus, Alburnus-alburnus, Ancylus, Barbus-meridionalispetenyi, Chondrostoma-nasus, Crayfish, Diptera, Distribution patterns, Ephemeroptera, Esox-lucius, Fish food, Gobio-gobio, Gobio-uranoscopus, Larvae, Leuiscus-cephalus, Lota-lota, Neomacheilus-barbatulus, Rivers, Rodents, *Romania Muresh River, Sex, Stenophagous, Structure, Thymallus-thymallus, Trichoptera, Trophic level, Vegetation.

The upper part of the Muresh River between its source and Toplitza (Romania) shows a combina-tion of living conditions and a rich ichthyocenosis with 19 fish spp. having different ecological requirements. The predominant species is the broad snout (Chondrostoma-nasus). The occurrence of various age groups and sex ratios as a result of adaptation to specific living conditions are presented on tables. In the Lota lota population the younger fish (1-3 yr old) predominate, while in the Leuciscus cephalus population the older fish (7-12 yr old) predominate. In the Barbus meridionalis petenyi population younger fish up to for yr old predominate. In contrast to populations of other Transylvanian rivers where 4 yr old fish predominate, 5 yr olds of C. nasus predominate in this section of the Muresh. Studies of the food of these fish were made using quantitative methods. Esox lucius eats benthic fish species, almost exclusively. Young eelpouts (L. lota) make up 54.87% of the food of the pike. L. lota eats predominantly benthic fish including its own young (66.75%). A total 30.40% of its food consists of benthic insect larvae and other aquatic inveryoung (66.75%). A total 30.40% of its food consists of benthic insect larvae and other aquatic invertebrates. The chub population of this river is stenophagous, rather than euryphagous. Its food consists of rodents (40.53%) and river crayfish (29.36%). Vegetation is important in the food of B. m. petenyi, Alburnus alburnus and Alburnoides bipunctatus. Diptera, Ephemeroptera and Trichoptera larvae make up the food of Thymallus thymallus, Gobio gobio, Gobio uranoscopus and Noemacheilus barbatulus. Ancylus is important in the food of G. gobio and G. uranoscopus. Feeding Noemachellus barbatulus. Ancylus is important in the food of G. gobio and G. uranoscopus. Feeding areas of the individual species were determined on the basis of qualitative and quantitative composition of the food. The upper Muresh is so rich in food that food competition between fish is insignificant.—Copyright 1973, Biological Abstracts,

THE FLORA AND VEGETATION OF POND--BANKS IN THE SOUTHERN PART OF THE ENTRE-SAMBRE-ET-MEUSE,

J. Duvigneaud. Nat Belg. Vol 53, No 1, p 2-18, 1972. Illus. Identifiers: Banks, "Belgium (Moulin pond), Cal-cium, Carbonates, Conductivity, Entre-Sambre-Et-Meuse, "Flora, Ponds, Substratum, "Vegeta-

Moulin pond, situated SW of Rance, Belgium, has moderately high water mineral content, is basic with a clear predominance of Ca++ and HCO3 ions, has good conductivity, and is of medium biogenic capacity, Fourchine pond, near Villers-La-Tour and Seloignes, Belgium, has low mineral content, slightly acid or neutral water, is of weak biogenic capacity and low conductivity. Each has its own distinctive vegetation which is determined partly by the geological substratum.—Copyright 1973, Biological Abstracts, Inc.

CONTRIBUTION TO THE KNOWLEDGE OF SCIRPETUM SILVATICI CZECHOSLOVAKIA (WESTERN PART), Ceskoslovenska Akademie Ved.

Botanicky Ustav.

Z. Neuhauslova-Novotna, and R. Neuhasl. Preslia (Praha). Vol 44, No 2, p 165-177, 1972. Il-

lus. Identifiers: Agrostis-canina, Cardamine-amara, Carex-spp, "Czechoslovakia, Glyceria-fluitans, Juncus-fliiformis, Moisture, Ranunculus-flammula, "Scirpetum-silvatici, Scirpus-sylvaticus, Soils, Viola-palustris.

Scirpetum silvatici (alliance Calthion) is a meadow association which grows on creek banks and areas with waterlogged soil. In western Czechoslovakia it is a replacement association in damp to wet Al-nion glutinoso-incane forests and comes in contact with various associations of inland areas. The soils of this association are severely influenced by a of this association are severely influenced by a more or less mobile ground water which lies in the upper levels of the soil throughout the year. Scir-pus silvaticus is the predominant species. The sub-association caricetosum with numerous dif-ferential species (including Carex species Ranun-culus flammula, Viola palustris, Juncus fliiformis and Agrostis canina) is the most frequent form of the Scirpetum silvatici. It grows on moorish soils

Group 21-Water in Plants

and wet gley with stagnant water. The subassocia-tion typicum has no differential species. In the area investigated it is represented by a Glyceria fluitans formation with a tendency toward paludal associations (differential species G. fluitans and Cardamine amara). In Czechoslovakia, this ascattoninte amara). In Czechosłovakia, this as-sociation is most frequent in hercynian areas. Its rare in the western Czechosłovakian pannonian.— Copyright 1973, Biological Abstracts, Inc. W73-13616.

ON THE HELMINTH FAUNA OF FISHES IN THE SMALL DANUBE (IN CZECH),
Slovenska Akademie Vied, Kosice oslovakia). Helmintologicky Ustav. R. Zitnan. Helminthologia (Bratisl). 10, p 313-320, 1969

Helminthologia (Brausi). 10, p 313-320, 1969 (1971), English summary.
Identifiers: Acanthocephala, Cestoidea, *C-zechoslovakia (Danube River), *Fauna, Fishes, *Helminth, Hirudinea, Monogeneoidea, Nematoda, Piscivorous, Trematoda.

Fishes (40) belonging to 13 species coming from he Small Danube near Jahodna, Czechoslovakia were examined in May 1963. The following hel-minth species were found: 23 Monogeneoidea, 8 Cestoidea, 6 Trematoda, 4 Nematoda, 3 Acanthocephala and 2 Hirudinea. The majority of helminth species (34) was parasites in 1 host species only but Metagonimus yokogawai occurred in 10. Diplostomum spathaceum in 9 and Posthodiplostomum cuticola in 5 fish species. The largest number of helminth species was found parasitizing Leuciscus cephalus (12) and Alburnus alburnus (12), less in Abramis brama danubii; (10), L. idus (9), Blicca bjoerkna (9) and Esox lucius (8). From the epizootological point of view Dactylogyrus extensus, D. vastator, Tetraonchus momenteron, Gyrodactylus katharneri and G. medius and teron, tyrtodactytus katharneri and O. medius and the larval stages of Diplostomum spathaccum are important. Posthodiplostomum cuticola and Ligula intestinalis whose definite hosts are piscivorous birds are of importance both in all fish-breeding farms of the Danube lowland and the planned dams of that region. Special attention from the epidemiological and epizootological standpoint should be devoted to the larval stages of M. yokogawai. The latter was found in 10 fish species, and they can infest not only men but also some domestic (pigs, cats and dogs) and fur animals.— Copyright 1973, Biological Abstracts, Inc. W73-13626

CONTRIBUTION TO THE STUDY OF THE CONDENSATION OF ORGANIC COMPOUNDS DURING HUMUS FORMATION IN A PODZOL-IC ENVIRONMENT (IN FRENCH), Ecole Nationale Superieure Agronomique de

Nancy (France). S. Bruckert, and F. Jacquin

S. Brückert, and F. Jacquin Bull Ec Natl Super Agron Nancy, Vol 13, No 1/2, p 28-35, 1971, Illus, English summary. Identifiers: Calluna-vulgaris, *Condensation, En-vironment, Formation, *Humus, *Organic com-pounds, Pinus-sylvestris, *Podzolic environment, Polymeric compounds, Rainfall.

Rainfall water of Pinus sylvestris and Calluna vul-Raintall water of Pinus sylvestris and Calluna vulgaris foliage contain organic compounds the molecular weight of which can reach 700. Polymerization processes increase in the mor humus and then in the Bh horizon. Eighty percent of humic polymeric compounds of the spodic horizon have a molecular weight below 6000.—Copyright 1973, Biological Abstracts, Inc. W73-13627

PHYTOSOCIOLOGICAL STUDY OF THE MAN-GROVES OF THE TULEAR REGION (MADAGASCAR): I. THE MANGROVE TREES OF SARODRANO AND TULEAR (IN FRENCH), Aix-Marseille Univ., Marseille (France). Laboratoire de Phytosociologie Cartographique. Tethys Suppl, 3. p 297-319, 1972, Illus, English Identifiers: Avicennia-officinalis, Bruguiera-gym

norrhiza, Ceriops-boviniana, Euphorbs, *Madagascar, *Mangroves, Monocots, Physicochemical studies, *Phytosociological studies, Rhizophora-mucronata, Soils, Sonneratia-alba, Topography, Trees.

Mangrove distribution in 2 estuary-type mangrove swamps of Tulear region is described; corresponding maps are presented and the phytosociological structure is explained according to the influence of topographic, pedologic, physicochemical and historic features. Important plant species found were Avicennia officinalis, Sonneratia alba, Bruguiera gymnorrhiza, Ceriops boviniana, Rhizophora mucronata, euphorbs and marine monocots.—Copyright 1973, Biological Abstracts, Inc. W73-13632

WATER AND PHOTOSYNTHESIS RELATIONS OF DESERT PLANTS IN THE MAURITANIAN SAHARA: III. SMALL SHRUBS: HEMICRYP-TOPHYTES AND GRASSES (IN GERMAN).

Flora (Jena), Vol 161, No 1/2, p 46-110, 1972, Illus,

English summary.
Identifiers: Abutilon-muticum, Africa, Aristida-pungens, Cassia-aschrek, Chrozophora-brocchi-ana, Citrullus-colocynthis, Corchorus-antichorus, ana, chrunus-cotocyntins, Cerebrus-antichorus, Cucumis-melo, Deserts, Evolution, Grasses, Leaf, *Mauritanian Sahara, Morphology, *Photosynthesis, Primary production, Shrubs, Sporobolus-spigatus, Transpiration, Zygophyl-lum-waterloti, *Hemicryptophytes, *Desert

Among the chamaephytes are trodden Cassia aschrek, with soft, pinnate leaves, Abutilon muticum, with soft, big, simple leaves, Chrozophora brocchiana, with smaller, slightly succulent leaves, Corchorus antichorus, prostrate with small leaves, and the succulent leaves. leaves, and the succulent-leaved Zygophyllum waterlotii. They remain active in the dry period, with water turnover and photosynthetic produc-tion which, in Cassia and Corchorus, still surpass the records of the trees. Less adapted to the desert the records of the trees. Less adapted to the desert life is Abutilon with big and soft leaves. The hemicryptophytic turnip-rooted Citrullus colocynthis and Cucumis melo belong to a special type, which protects the juicy leaves from the heat-death by a strong transpiration. The dunegrasses Aristida pungens and Sporobolus spicatus are characterized by the minute regulation of the water-balance, characteristic of the grass-type. Aristida pungens possesses rolling-up leaves of Aristida pungens possesses rolling-up leaves of highest perfection, and is able to maintain a positive photosynthesis on the base of a low but very economical transpiration, even during extreme dry periods. The different physiognomy of the Northern and Southern Sahara, Africa, i.e., dif-Northern and Southern Sahara, Africa, i.e., dif-fuse bush- and contracted tree-desert, is the con-sequence of the different genetical and constitu-tional substance, which the northward and southward adjoining steppe and savanna vegeta-tions had to offer for the evolution of the desert vegetation. (See also W72-00726).—Copyright 1973, Biological Abstracts, Inc.

2J. Erosion and Sedimentation

ENGINEERING HYDROLOGY, Oregon State Univ., Corvallis. Water Resources Research Inst.
For primary bibliographic entry see Field 03B.
W73-13016

A STUDY OF SEDIMENT TRANSPORT IN NORWEGIAN GLACIAL RIVERS, 1969, Norsk Institutt for Vannforskning, Blindern. G. Ostrem, T. Ziegler, and S. R. Ekman.

Alaska University Institute of Water Resources Fairbanks Publication No IWR-35, February 1973. 59 p. 29 fig. 20 ref. (Translated from Norway Institute of Water Resources, Department of Hydrology Report 6/70, September 1970). OWRR-A-042-ALAS (1).

Descriptors: *Sediment transport, *Glacial sediments, *Melt water, *Glaciers, Movement, Scour, Temperature, Rainfall, Summer, Data collections, Gaging stations, Streamflow, Sediment yield. Identifiers: *Norway, *Glacial rivers.

The studies of transport of solid particles in Nor-wegian glacial rivers have a double purpose. First, the studies are useful for those who wish to exploit the water, either for the drinking purposes or for the production of electric power. Second, the studies have a scientific value, as the glaciers over a longer period have a great landscaping effect. Geographers and geomorphologists have always wished to obtain knowledge of the eroding velocity of glaciers. In this respect, studies of sediment transport in glacial rivers may furnish valua-ble information. The observation stations were placed as close as possible to the glacial front, at a point where the melt water is contained in one channel. The highest sediment concentration of the 1969 summer observation period was 3,037 mg/liter, measured on July 30, while the lowest concentration, 11 mg/liter, was measured August 25. The first high sediment concentrations and large daily transports for the observation period are associated with high daily mean temperatures, glacier ablation, and discharge from the glacier between June 17 and 27. The large transport during this period was mainly caused by erosion of sedi-ment by the glacier. (Woodard-USGS) W73-13026

REGIME, THEORY, AND METHODS OF CAL-CULATION AND MEASUREMENT OF SEDI-MENTS AND WASTE WATERS (REZHIM, TEORIYA, METODY RASCHETA I IZ-MERENIYA NANOSOV I STOCHNYKH VOD). Gosudarstvennyi Gidrologicheskii Institut, Lenin-

Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 191, A. V. Karaushev, and I. V. Bogolyubova, editors, Leningrad, 1972. 220 p.

Descriptors: *Sediments, *Sediment discharge, *Sediment yield, *Sediment transport, *Waste water (Pollution), Water pollution, Self-purification, Streams, Channels, Reservoirs, Discharge (Water), Sediment load, Suspended solids, Parti-cle size, Particle shape, Settling velocity, Turbidi-ty, Erosion, Statistical methods, Computers. Identifiers: USSR, *European USSR, Competence (Streams)

Problems of sediment movement in streams and sediment measurement are discussed in this publication, the ninth in a series entitled 'Regime, Theory, and Methods of Calculation and Measurement of Sediments and Waste Waters,' prepared by workers of the sediment laboratory of Leningrad State Hydrologic Institute. Improved methods are presented for computing sediment transport in lowland and mountain streams and waste water dilution in rivers, and an optical method for measurement of turbidity in reservoirs is described. Investigations are made of suspended-load and bed-load discharges, size composition of bottom sediments, and settling velocity of natural sediment grains. Recommendations are given for computing sediment yield of ungaged rivers in European Russia. (See W73-13046 thru W73-13054) (Josefson-USGS)

SEDIMENT YIELD OF STREAMS IN EUROPE-AN RUSSIA (STOK NANOSOV YEVROPEYSKOY TERRITORII SSSR), Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR). K. N. Lisitsyna, and V. I. Aleksandrova.

In: Rezhim, teoriya, metody rascheta i izmereniya nanosov i stochnykh vod; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 191, p 23-52, Leningrad, 1972. 4 fig, 7 tab, 23 ref.

Descriptors: *Sediment yield, *Sediment discharge, *Streams, Watersheds (Basins), Erosion, Geomorphology, Meteorology, Discharge (Water), Turbidity, Particle size, Suspended solids, Correlation analysis, Regression analysis, Variability, Equations, Curves, Maps. Identifiers: *European USSR.

Division of European Russia into 9 erosion zones was based on observations of sediment yield at 206 stations in the area, excluding the Causcasus. Principal factors used to measure sediment yield were water discharge, channel slope, average basin elevation, density of the drainage network, and elevation, density of the dramage network, and lake-surface and waterlogged areas of the river basin. Regression equations obtained by multiple linear correlation were used to calculate average annual sediment yield and average annual turbidity of streams. Variability and seasonal distribution of annual sediment yield are examined, and a map shows the particle-size distribution of suspended colids. Sadiment yield of large rivers in the White solids. Sediment yield of large rivers in the White, Barents, Baltic, Black, Azov, and Caspian Sea basins is tabulated. (See also W73-13045) (Josef-W73-13046

RELATION OF AVERAGE LONG-TERM SUSPENDED-SEDIMENT YIELD OF STREAMS IN EUROPEAN RUSSIA TO PHYSIOGRAPHIC FACTORS (ZAVISIMOST' SREDNEGO MNOGOLETNEGO STOKA VZVESHENNYKH NANOSOV REK YEVROPEYSKOY TERRI-TORII SSSR OT FIZIKO-GEOGRAFICHESKI KH FAKTOROV), Gosudarstvennyi Gidrologicheskii Institut, Lenin-

grad (USSR). N. N. Bobrovitskaya.

In: Rezhim, teoriya, metody rascheta i izmereniya nanosov i stochnykh vod; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 191, p 68-84, Leningrad, 1972. 3 fig. 3 tab, 34 ref.

Descriptors: *Sediment yield, *Sediment discharge, *Suspended solids, *Streams, *Geomorphology, Topography, Erosion Watersheds (Basins), Discharge (Water), Correla-*Sediment tion analysis, Regression analysis, Equation Identifiers: *European USSR.

Relation of average long-term suspended-sediment yield of streams to physiographic conditions in lowland regions of European Russia is analyzed. Six large erosion zones are identified on the basis of geomorphological delineation of the area and consideration of climatic factors. Analysis of suspended-sediment yield within zones is based on multiple correlation methods and consideration of differences in stream gradients and forested and plowed areas. Basic factors determining suspended-sediment discharge into streams are water discharge and geomorphological features of the region. (See also W73-13045) (Josefson-USGS) W73-13047.

CALCULATION OF SUSPENDED-SEDIMENT TRANSPORT BY MOUNTAIN STREAMS (K VOPROSU O RASCHETE TRANSPORTA VZ-VESHENNYKH NANOSOV GORNYMI

Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR). I. V. Bogolyubova.

In: Razhim, teoriya, metody rascheta i izmereniya nanosov i stochnykh vod; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 191, p 85-99, Leningrad, 1972. 2 fig, 5 tab, 8 ref.

Descriptors: "Sediment transport, "Suspended solids, "Streams, "Mountains, Bottom sediments, Coarse sediments, Particle size, Turbidity, Curves, Equations.

Identifiers: USSR, Competence (Streams).

A method was proposed for applying the equation of sediment-saturated flow developed by A. V. Karaushev to calculation of the transporting Karaushev to calculation of the transporting capacity of mountain streams. The Karaushev method of calculating suspended-sediment transport can be used for mountain streams, where coarse sediments comprise a large percentage of bottom sediments and can substantially reduce stream capacity to transport suspended solids. (See also W73-13045) (Josefson-USGS) W73-13045) W73-13048

EXPERIMENT IN DETERMINING TOTAL SEDIMENT DISCHARGE (SUSPENDED LOAD AND BED LOAD) (OPYT VYCHISLENIYA POL-NOGO RASKHODA NANOSOV (VZVESHEN-NYKH I VLEKOMYKH)), Gosudarstvennyi Gidrologicheskii Institut, Lenin-

d (USSR). grad (USSR). K. V. Razumikhina.

In: Rezhim, teoriya, metody rascheta i izmereniya nanosov i stochnykh vod; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 191, p 100-110, Leningrad, 1972. 3 fig, 5 tab, 13 ref.

Descriptors: *Sediment discharge, *Suspended load, *Bed load, *Sediments, *Sediment transport, Bottom sediments, Suspended solids, Dunes, Particle size, Discharge (Water), Turbidity, Equa-

Identifiers: *European USSR, *Polomet' River.

Determination of bed-load discharges was based on dune movement of sediments in the Polomet' River at Yazhelbitsy. A ratio was obtained between bed-load and suspended-load discharges, and a determination was made of total sediment discharge. Recommendations are given for determining total sediment discharge on the basis of data on suspended-sediment discharges, dune movement of sediments, and particle-size composition of suspended and bottom sediments. (See also W73-13045) (Josefson-USGS)

EXPERIMENTAL INVESTIGATION OF SET-TLING VELOCITY OF SEDIMENTS (EKSPERI-ISSLEDOVANIYE GIDRAVLICHESKOY KRUPNOSTI NANOSOV), Gosudarstvennyi Gidrologicheskii Institut, Lenin-

grad (USSR). V. V. Romanovskiy.

V. V. Kolnamovsky.

In: Rezhim, teoriya, metody rascheta i izmereniya nanosov i stochnykh vod; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 191, p 111-136, Leningrad, 1972. 3 fig, 9 tab, 13 ref.

Descriptors: *Laboratory tests, *Settling velocity, Descriptors: "Sediment transport, Particle shape, Particle size, Stokes law, Viscosity, Suspension, Deposition (Sediments), Laminar flow, Turbulent flow, Reynolds number, Water temperature, Instrumentation, Measurement, Curves, Equations. Identifiers: USSR.

Tests were conducted at the sediment laboratory Tests were conducted at the sediment laboratory of the Leningrad State Hydrologic Institute to study settling velocity of natural sediment grains and influence of grain shape on their settling rate. Settling velocity was measured for grains with a diameter ranging from 0.0004 cm to 7.5 cm. The relation of settling velocity to grain diameter and shape is graphed, and analytical expressions of settling velocity are presented for laminar and tur-

ulent flow. (See also W73-13045) (Josefson-USGS)

VARIATIONS IN GRAIN SIZE OF BOTTOM SEDIMENTS IN GRAIN SIZE OF BOTTOM SEDIMENTS IN LOWLAND AND MOUNTAIN STREAMS (IZMENCHIVOST' KRUPNOSTI DONNYKH OTLOZHENIY RAVNINNYKH I GORNYKH OKK), GOSUGARSTVENNY GİGTOLOĞICHESKİİ İNSTİTUL, Lenin-

Gosudarstvennyi Gidrologichesa.
grad (USSR).
G. A. Petukhova.
In: Rezhim, teoriya, metody rascheta i izmereniya nanosov i stochnykh vod; Gosudarstvennyy Gidrologicheskiy Institut Trudy. No 191, p 137-158, Leningrad, 1972. 8 tab, 25 ref.

Descriptors: "Bottom sediments, "Particle size, Streams, "Variability, "Sediment transport, Sampling, Statistical methods, Sediment sorting, Photography, Equations.
Identifiers: USSR, *Baksan River basin (USSR), *Don River (USSR).

Investigations were carried out in 1968-69 by the sediment laboratory of the Leningrad State Hydrologic Institute to study size composition of bottom sediments in mountain streams of the Baksan River basin and in the Don River at Niikolayevskaya Station. Variations in grain size of bottom sediments depend on morphometric characteristics of the river reach and, presumably, on th direction of erosion-aggradational processes. The number of samples needed for reliable size analy-sis is derived statistically, and a recommendation is made for studying size composition of bottom sediments in mountain streams at low stages dur-ing free channel access. (See also W73-13045) (Josefson-USGS) W73-13051

STUDY OF SUSPENDED SEDIMENTS IN RESERVOIRS BY THE METHOD OF SPEC-TRAL DIFFUSIVITY (IZUCHENIYE VZ-VESHENNYKH NANOSOV V VODOK-HRANILISHCHAKH METODOM SPEKTRAL'-NOY YARKOSTI), Gosudarstvennyi Gidrologicheskii Institut, Lenin

grad (USSR). A. G. Kal'ko.

In: Rezhim, teoriya, metody rascheta i izmereniya nanosov i stochnykh vod; Gosudarstvennyy Gidrologicheckiy Institut Trudy, No 191, p 159-171, Leningrad, 1972. 5 fig, 4 tab, 12 ref.

*Reservoirs, *Analytical techniques, Optical properties, Reflectance, Light, Turbidity, Particle size, Humus, Instrumentation, Measurement, Curves, Equations. Identifiers: USSR, *Spectral diffusivity.

Application of the method of spectral diffusivity to study of fine-grained suspended sediments was based on investigations carried out at the Kayrakbased on investigations carried out at the Asyras-kum, Dubossary, and Minchegaur Reservoirs and on the Polomet' River in 1966-68. Changes in the curve of spectral diffusivity coefficients are as-sociated with turbidity, suspended-sediment size, sociated with turbidity, suspended-sediment size, presence of humus substances, and reflectance of suspended material. The method is promising for studying turbidity in surface layers of water bodies and will be useful in studying plan structure of flows in reservoirs and lakes provided the water masses transported by flows differ in their optical properties. (See also W73-13045) (Josefson-USGS) W73-13052

USE OF COMPUTERS TO COMPUTE UNSTEADY WIND CURRENTS IN BODIES OF WATER AS ILLUSTRATED BY LAKE BAYKAL (PRIMENENIYE EVM DLYA RASCHETA NEUSTANOVIVSHIKHSYA VETROVYKH

Group 2J-Erosion and Sedimentation

TECHENIY V VODOYEMAKH (NA PRIMERE OZ. BAYKAL)), Gosudarstvennyi Gidrologicheskii Institut, Lenin-

grad (USSR). For primary bibliographic entry see Field 02H. W73-13053

AN IMPROVED QUICK-FIELD METHOD OF CALCULATING WASTE WATER DILUTION IN RIVERS (USOVERSHENSTVOVANIYE EK-SPRESS-METODA RASCHETA RAZ-BAVLENIYA STOCHNYKH VOD V REKAKH), GOSUGARSTVENIY GİĞROLOĞICLEŞKİİ İNSTİLLI, LENİN-CALÇI

grad (USSR).
For primary bibliographic entry see Field 05B.
W73-13054

POSTDEPOSITIONAL OSMOTIC ADJUST-MENTS IN SEDIMENTS FROM SOAP LAKE,

WASHINGTON,
Duke Univ., Durham, N.C. Dept. of Zoology.
M. A. Mantuani.

Limnology and Oceanography, Vol 18, No 3, p 403-413, May 1973. 6 fig, 17 ref.

Descriptors: *Pore water, *Bottom sediments, Descriptors: "Pore water, "Bottom sediments, "Salinity, "Osmosis, Connate water, Mass transfer, Diffusion, Alkalinity, Chemical poten-tial, Ion exchange, Clay minerals, Diagenesis, Water chemistry, "Washington. Identifiers: "Soap Lake (Wash).

Sediments from Soap Lake, an alkaline saline lake on the arid Columbia Plateau, demonstrate postdepositional changes in response to a measured osmotic potential gradient through the sediment. The primary mechanism for osmotic readjustment is redistribution of water and dissolved ions through the sediment, altering sediment water con-tent and pore water salinity. This redistribution provides a mechanism for mobilizing ions from exchange sites and from minerals to form pore waters of altered composition. (Knapp-USGS) W73-13064

ENZYMATIC NH3-N DETERMINATION: A SPECIFIC METHOD FOR THE DETERMINATION OF AMMONIA IN WATER AND SEDI-

MENTS, Hydrobiologisch Institutt, Nieuwersluis (Netherlands).

For primary bibliographic entry see Field 05A. W73-13068

FOSSIL PIGMENTS IN THE SURFACE SEDI-MENTS OF A MEROMICTIC LAKE, Minnesota Univ., Minneapolis. Dept. of Botany. For primary bibliographic entry see Field 05B. W73,13099

BRIEF FIELD GUIDE TO INTERTIDAL SEDI-MENTS, MINAS BASIN, NOVA SCOTIA, McMaster Univ., Hamilton (Ontario). Dept. of

Geology. For primar W73-13204 nary bibliographic entry see Field 02L.

RECONNAISSANCE SURVEY O ISLAND, PRINCE EDWARD ISLAND, McMaster Univ., Hamilton (Ontario). OF

S. B. McCann.
Maritime Sediments, Vol 8, No 3, p 107-113,
December 1972. 9 fig, 1 tab, 6 ref.

Descriptors: *Waves (Water), *Ocean waves, Beach erosion, Winds, Surf, Refraction (Water waves), Fetch. Identifiers: *Gulf of St. Lawrence.

Hog Island, on the north coast of Prince Edward d, is a 10-mile long barrier island which separates Malpeque Bay from the open waters of the Gulf of St. Lawrence. The island exhibits all the characteristic features of the sand beach and dune barriers of Prince Edward Island and, being relatively inaccessible, is in a fairly natural state. Basically it consists of a series of vegetated dune ridges, with associated marsh areas at the rear, the continuity of the main dune ridges being broken by two large washover fans. The end of the island has undergone considerable changes since 1933 the two large washover fans. The end of the island has undergone considerable changes since 1935, the main trend being an extension of the shoreline for 600 ft in a southeast direction. There has been an associated 200-ft extension of the dune area in this direction, but this has been accompanied by a marked retreat of the seaward dunes. Size frequency curves for the beach foreshore, breaker zone, trough (closest to the offshore bar), offshore bar dune and two leacon samples were plotted on zone, trough (closest to the offshore bar), offshore bar, dune and two lagoon samples were plotted on arithmetic probability paper. All the samples illus-trated have one dominant component (saltation population) but differ in the presence or absence of secondary components (traction or suspension populations), (Knapp-USGS) W73-13205

BARRIER ISLANDS, SAND SPITS AND DUNES IN THE SOUTHERN GULF OF ST. LAWRENCE, McMaster Univ., Hamilton (Ontario). S. B. McCann, and E. A. Bryant. Maritime Sediments, Vol 8, No 3, p 104-106, December 1972. 13 ref.

Descriptors: *Beaches, *Sand bars, *Sand spits, *Dunes, Canada, Waves (Water), Littoral drift, Sedimentation, Beach erosion. Identifiers: *Gulf of St. Lawrence, *Prince Edward Island.

Many miles of the northern coast of Prince Ed-Many miles of the northern coast of Prince Ed-ward Island and the eastern coast of New Brun-swick consist of long sand beaches fronting nar-row barrier islands or sand spits, some of which have well developed dunes. The present barrier island systems probably originated at the lower sea-levels of the Holocene as coastal beaches and spits which were able to build up significant dunes and beach deposits. As sea level rose the land behind these dunes was flooded forming lagoons. The beaches and dunes then underwent shoreward ettreat as sea level continued to rise. The barrier terteat as sea level continued to rise. The barrier retreat as sea level continued to rise. The barrier retreat as sea level continued to rise. The barrier islands thus represent a dynamic equilibrium between the slope of the land, the rise of sea level, and the intensity of wave attack. Over the past 150 year: the Kouchibougauc barriers show evidence of frequent breaching of the islands and infilling of inlet systems that is a response to the wave refracmuet systems that is a response to the wave refraction patterns of storm waves and the subsequent redistribution of sediment along the coastline. Not only are the barrier islands changing shape they are also being pushed shorewards as evidenced by accurate charts since 1839 and good aerial photographs since 1930. (Knapp-USGS) W73-13206

IN SITU ACTIVATION ANALYSIS OF MARINE SEDIMENTS WITH CALIFORNIUM-252, Battelle Memorial Inst., Richland, Wash. Pacific Northwest Labs. For primary bibliographic entry see Field 02K. W73-13295

SUSPENDED-SEDIMENT YIELD FROM THE ABRAMOV GLACIER BASIN (STOK VZ-VESHENNYKH NANOSOV S BASSEYNA LEDNIKA ABRAMOVA),

Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent

For primary bibliographic entry see Field 02C. W73-13355

REGULAR MEANDER PATH MODELS, Hull Univ. (England). Dept. of Geography.

For primary bibliographic entry see Field 02E. W73-13370

UPPER MISSISSIPPI RIVER COMPREHENSIVE BASIN STUDY, APPENDIX G-FLUVIAL SEDI-

Army Engineer District, Rock Island, Ill.
For primary bibliographic entry see Field 06B.
W73-13487

NEAR-SHORE RIPPLES: SOME HYDRAULIC

RELATIONSHIPS, Windsor Univ. (Ontario). Dept. of Geography. For primary bibliographic entry see Field 08B. W73-13330

A SEDIMENT SQUEEZER FOR REMOVAL OF PORE WATERS WITHOUT AIR CONTACT, California Univ., Los Angeles. Dept. of Geology. E. K. Kalil, and M. Goldhaber. Journal of Sedimentary Petrology, Vol 43, No 2, p 553-557, June 1973. 4 fig, 11 ref. AEC Grant AT (04-3)-34 P.A. 134.

Descriptors: *Pore water, *Connate water, *Sediments, *Sampling, *Sedimentology, *Equipment, *Laboratory equipment, Identifiers: *Pore water squeezer.

A low-pressure mechanical squeezer was designed A low-pressure mechanical squeezer was designed for removing interstitial water from ocean sedi-ments with only minimal or no air contact. The plastic liner in which the sediment was collected serves as the squeezing chamber, reducing oxida-tion of sulfides and gas exchange of CO2. Pore water is collected from both ends of a 10-cm section of core, increasing squeezing efficiency. The system is easily thermoregulated to operate at bottom temperatures. As this squeezer is inexpensive and easy to build, several units may be operated at once. (Knapp-USGS)

A VIBRATORY CORING SYSTEM FOR CON-

TINENTAL MARGIN SEDIMENTS, Rhode Island Univ. Kingston. Graduate School of Oceanography.
R. L. McMaster, and C. E. McClenner

Journal of Sedimentary Petrology, Vol 43, No 2, p 550-552, June 1973. 1 fig, 5 ref. ONR Contract N00014-68-A-0215-0003.

Descriptors: *Sampling, *Cores, *Core drilling, *Continental shelf, *Bottom sediments, Equipment, Sedimentology. Identifiers: *Core drill (Vibratory).

A vibratory coring system was developed to san ple sands on continental margins for more detailed data concerning sedimentary processes. It consists of three vibration mechanisms with attached 2 m ot unree vibration mechanisms with attached 2 m coring tubes, a battery powered energy source, and a locking compass for orientation. Coring units, 2 m apart, are located at the apices of a tri-angular platform. Field tests indicate that the system is operational at all depths on the continen-tal shelf. (Knapp-USGS) W73-13532

AN ELUTRIATOR METHOD FOR PARTICLE-

AN ELUINIA RABIND FOR PARTICLE-SIZE ANALYSIS WITH QUANTITATIVE SILT FRACTIONATION, Illinois State Geological Survey, Urbana. L. R. Follmer, and A. H. Beavers. Journal of Sedimentary Petrology, Vol 43, No 2, p 544-549, June 1973. 1 fig, 2 tab, 5 ref.

Descriptors: *Silts, *Particle size, *Analytical techniques, *Settling velocity, Sampling, Equipment, Sedimentology.
Identifiers: *Elutriation.

Erosion and Sedimentation—Group 2J

An elutriator was developed to increase laboratory efficiency in particle-size and mineralogical analyses of silt. The elutriator, described quantitatively, separates silts into three predetermined size fractions, which are clean and suitable for mineralogical analysis. To complete the particle-size analysis, sand fractions are determined by sieving and clay fractions are determined by the pipette method. (Knapp-USGS) W73-13533

COMPARISON BETWEEN COMPRESSIBILI-CUMPAKISON BETWEEN COMPRESSIBILITIES OF SANDS AND CLAYS,
University of Southern California, Los Angeles.
Dept. of Petroleum Engineering.
For primary bibliographic entry see Field 02G.
W73-13534

A SPLITTER FOR UNCONSOLIDATED CORES TAKEN IN PLASTIC LINERS, Rosenstiel School of Marine and Atmospheric

Sciences, Miami, Fla. T. W. Durden, and H. Frohlich.

Journal of Sedimentary Petrology, Vol 43, No 2, p 521-524, June 1973. 2 fig, 2 ref. ONR N0014-67-A-0201-0013 NSF GA-15226 and GA 25016.

Descriptors: *Sampling, *Cores, *Equipment, Sedimentology, Sediments, Analytical techniques, Laboratory equipment. Identifiers: *Core splitter.

An inexpensive machine was developed to split (longitudinally) cores of uncolsolidated sediments without extruding them from the plastic tubing in which they were collected. This machine has four main advantages: (1) minimal amount of core disturbance, (2) speed and simplicity of operation, (3) accommodation of cores of various lengths and dismeters. (3) accommodation of cores of various lengths and diameters, and (4) portability. The method of operation begins by mechanically pushing a core in its linear, laid in a V-shaped trough, through a set of gas burners which are diametrically opposed in a plane vertical to the trough. This step slightly heats the plastic liner along a thin line on opposite sides of the liner. Immediately following the burners is 0.045-inch diameter piano wire strung in the game plane as the humers. After the lines corrected. same plane as the burners. After the liner emerges from the burners the soft plastic is easily cut by the piano wire and the core and liner are sliced into equal halves. (Knapp-USGS) W73-13535

SIEVE LOAD EQUATIONS AND ESTIMATES OF SAMPLE SIZE, California State Univ., Sacramento. Dept. of

Geology. N. C. Janke.

Journal of Sedimentary Petrology, Vol 43, No 2, p 518-520, June 1973, 4 ref.

Descriptors: *Sedimentology, *Sieve analysis, Equations, Sampling, Particle size, Particle shape. Identifiers: *Sieve loads.

A semi-empirical expression for sieve loads is given in terms of the sieve aperture in mm and the phi interval between sieves. The acceptable load on a 1.00-mm sieve, whether it is used or not, is on a 1.00-mm sieve, whether it is used or not, is given in terms of weight density, a shape factor, long and short particle intercepts, the number of finer near-mesh particles, and a parameter that va-ries with the internal diameter of the sieve. Equa-tions for sieve loads can also be an aid in estimat-ing sample size. (Knapp-USGS) W73-13536

THE SIGNIFICANCE OF THE SOLUTION OF FELDSPAR IN POROSITY DEVELOPMENT, West Virginia Univ., Morgantown. Dept. of Geology and Geography.

M. T. Heald, and R. E. Larese.
Journal of Sedimentary Petrology, Vol 43, No 2, p 458-460, June 1973. 1 fig, 1 tab, 5 ref.

Descriptors: *Porosity, *Pores, *Mineralogy, *Weathering, *Diagenesis, Groundwater movement, Groundwater. Identifiers: *Feldspars.

Post-depositional solution of feldspar is an impor-tant process in porosity development in some for-mations. Solution is very selective and may result in considerable reduction in the amount of feldspar and significant change in proportion of feld-spar types. (Knapp-USGS) W73-13537

THE ORIGIN AND SIGNIFICANCE OF SOME DOWNCURRENT-DIPPING -STRATIFIED SETS.

ele Univ. (England). Dept. of Geology. N. L. Banks.

Journal of Sedimentary Petrology, Vol 43, No 2, p 423-427, June 1973. 6 fig. 11 ref.

Descriptors: "Sedimentary structures, "Stratifica-tion, "Ripple marks, Alluvial channels, Bed load, Sand waves, Dunes. Identifiers: "Norway.

Downcurrent dipping sets of cross stratification occur in late Precambrian fluvial sandstones in northern Norway. The sets form cosets up to 4 m thick. The sets are wedge shaped or lens shaped, dip at less than 8 deg relative to the horizontal, and have erosive boundaries. The geometry of the sets suggests that they were formed by the migration of large scale ripples over a bed which was wavy on a scale larger than that of the ripples. This wavy bedform was also moving downcurrent but at a slower rate than the ripples. It is estimated that the downstream faces of the wavy bedforms dipped at less than 11.5 deg and that the ripples moved at less than 11.5 deg and that the ripples moved at less than 11.5 deg and that the waves. The waves least 3.2 times as fast as the waves. The waves may be comparable with either the major midchannel waves or the side bars of some modern streams. (Knapp-USGS)

OSTLER LENSES: POSSIBLE ENVIRONMEN-TAL INDICATORS IN FLUVIAL GRAVELS AND CONGLOMERATES, Guelph Univ. (Ontario). Dept. of Land Resource

I. P. Martini, and J. Ostler.

Journal of Sedimentary Petrology, Vol 43, No 2, p 418-422, June 1973. 8 fig, 1 tab, 7 ref.

Descriptors: *Sedimentary structures, *Bed load, *Sediment transport, Sand bars, Braiding, Turbu-lent flow, Alluvial channels, Gravels. Identifiers: Ostler lenses.

The Ostler lens is a sedimentary structure ob-served in recent and ancient coarse gravelly sequences. In recent environments they are small dunes, mounds, or small transverse bars made up of rounded, sorted small pebbles. They are found of rounded, sorted smale peoples. Inel. are todan in streams carrying predominantly coarse gravel to fine pebble materials, usually in shallow reaches at the downstream end of braid islands, bars, and point bars. Ostler lenses record essentially normal stands, ours, and on our ormal stands, ours, and point bars. Ostler lenses record essentially unidirectional to slightly convergent flow and turbulent lower flow regime conditions for the riffle (shallower) parts of alluvial channels. (Knapp-USGS) W73-13539

MINERAL CONCENTRATING
S AND DENSITY/SHAPE/SIZE HEAVY PROCESSES PROCESSES AND DENSITY/SHAPE/SIZE EQUILIBRIA IN THE MARINE AND COASTAL DUNE SANDS OF THE APALACHICOLA, FLORIDA, REGION, Florida State Univ., Tallahassee. Dept. of Geolo-

For primary bibliographic entry see Field 02L.
W73-13540

HEAVY MINERALS OF HORN ISLAND, NORTHERN GULF OF MEXICO, Louisiana State Univ., Baton Rouge. Dept. of

W. E. Harrison. Journal of Sedimentary Petrology, Vol 43, No 2, p 391-395, June 1973. 3 fig, 2 tab, 7 ref.

Descriptors: "Mineralogy, "Provenance, "Sand bars, "Gulf of Mexico, "Mississippi, Metamorphic rocks, Sediment transport, Rivers, Littoral drift. Identifiers: "Heavy minerals.

The heavy mineral assemblage of Horn Island, a barrier island in the northern Gulf of Mexico 8-10 miles off Mississippi, is diagnostic of a metamorphic source area. The crystalline mutes out metamorphic source area. The crystalline metamorphic region in east-central Georgia which is drained by the South Alabama and Apalachicola Rivers and their respective tributaries is suggested as the ultimate source area for the heavy minerals. (Knapp-USGS) W73-13541

OCEANIC SEDIMENTS AND THEIR DIAGENE-SIS: SOME EXAMPLES FROM DEEP-SEA DRILLING, Scripps Inst. of Oceanography, La Jolla, Calif. Deep Sea Drilling Project. T. A. Davies, and P. R. Supko. Journal of Sedimentary Petrology, Vol 43, No 2, p 381-390, June 1973. 13 fig, 30 ref.

Descriptors: *Bottom sediments, *Oceans, *Sampling, *Stratigraphy, *Diagenesis, Cores, Mineralogy, Sedimentary rocks, Geochemistry.

Cores collected by drilling in the deep ocean provide samples of deeply buried ocean sediments in the process of becoming sedimentary rocks. Carbonate sediments have been dominant in deep-sea sediments since at least the Jurassic, except during the Earst behavior the Eocene when siliceous sediments became dominant. The sonic velocity is consistently lower than the velocity determined from refraction measurements. A sequence of diagenetic changes progresses from breakup of individual coccoliths to solution and recementation. Dolomite rhombs are related to either igneous activity, to evaporitic conditions prevailing in the past, or to geochemical control in a reducing environment. Chert, both nodular and bedded, is reported from both the North Atlantic and Pacific oceans, but not the South Atlantic. Chert is associated with all litholosouth Atlantic. Chert is associated with an innois-gies and ages of sediment but is most common in siliceous sediments of Eocene or older age. The silica in nodular cherts is biogenic in origin. Basal sediments in the oceans are commonly enriched in iron. The iron-rich sediments formed when the basement was near the crest of the mid-ocean ridge and have moved to their present positions by seafloor spreading. (Knapp-USGS) W73-13542

NEW JERSEY CONTINENTAL SHELF NEAR BOTTOM CURRENT METER RECORDS AND RECENT SEDIMENT ACTIVITY, Rhode Island Univ., Kingston. Graduate School of

Oceanography. C. E. McClennen. Journal of Sedimentary Petrology, Vol 43, No 2, p 371-380, June 1973. 5 fig, 1 tab, 41 ref.

Descriptors: *Continental shelf, *Bottom sediments, *Sedimentary structures, *Sediment transport, *Sedimentation, *New Jersey, Scour, Erosion, Littoral drift, Waves (Water), Currents (Water). Current meters.

Modern sedimentary processes associated with Modern sedimentary processes associated with the ridge and depression topography of the New Jersey continental shelf were investigated with the aid of near bottom current meter measurements. Estimates of near bottom wave orbital velocities were derived from classical wave theory and

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available surface wave observations. Four current meters were set 1.5 to 2.0 m above sea bottom in 30-, 59-, 74-, and 143-m depths for 9 to 11 days dur-ing the late springs of 1970 and 1971. The root mean square speeds of the meter records were 13.7, 11.8, 12.9, and 19.5 cm/sec in order of increasing depth, with a maximum recorded 2.5 minute average speed of nearly 40 cm/sec and a met southwesterly transport. Both current and wave data indicate reworking of the surface sand cover on the shelf. In determining the relative importance of wave vs current activity, the true value of the critical erosion velocity is of primary primary ng of the importance. The present physical reworking of the surface sediments is indicated independently by bottom photographs of ripples and by sedimentary structures, with reworking generally limited to the upper meter of sediment. No mechanism for the present formation of the larger scale ridge and depression topography is indicated by the currents measured or the wave considerations. (Knapp-TISCE W73-13543

2K. Chemical Processes

DETERMINATION OF LOW PHOSPHATE CONCENTRATIONS IN SEAWATER BY AN ISOBUTYI ACETATE EXTRACTION

Osservatorio Geofisico Sperimentale, Trieste (Ita-

For primary bibliographic entry see Field 05A. W73-13057

INTERACTION OF YELLOW ORGANIC ACIDS WITH CALCIUM CARBONATE IN FRESH-

WATER,
Michigan State Univ., Hickory Corners. W. K.
Kellogg Biological Station.
For primary bibliographic entry see Field 05B.

A REACTIVE SILICATE BUDGET FOR THE ARCTIC OCEAN, Washington Univ., Seattle. Dept. of Oceanog-

L. A. Codispoti, and D. Lowman.

Limnology and Oceanography, Vol 18, No 3, p 448-456, May 1973. 3 fig, 2 tab, 27 ref. ONR N-00014-67-A-0103-0014.

Descriptors: *Arctic Ocean, *Sea water, *Silicates, *Silica, *Water chemistry, Aqueous solutions, Provenance, Water circulation, Ocean cur-

Available data permit formulation of a reactive silicate budget for the Arctic Ocean. There is fairly good agreement between the input and removal terms. Arctic rivers do not appear to have unusually high reactive silicate concentrations and the budget indicates that the Arctic Ocean is not a major source for reactive silicate; it could even be a sink. The Bering Strait inflow may exit primarily via the Canadian Archipelago. (Knapp-USGS) W73-13061

SIZE CLASSES OF ORGANIC CARRON IN SEAWATER, Dalhousie Univ., Halifax (Nova Scotia). Inst. of

Oceanography. For primary bibliographic entry see Field 05B. W73-13062

A NEW METHOD FOR DETERMINING THE TOTAL CARBONATE ION CONCENTRATION IN SALINE WATERS

Lamont-Do Geological Observation. erty Palisades, N.Y. H. J. Simpson, and W. S. Broecker.

Limnology and Oceanography, Vol 18, No 3, p 426-440, May 1973. 11 tab, 13 ref.

Descriptors: "Chemical analysis, "Water analysis, "Carbon dioxide, "Carbonates, "Saline water, Aqueous solutions, Water chemistry, Analytical techniques. techniques. Identifiers: *Carbonate analysis

A new method of determining total carbonate ion content of saline waters requires measurement of the partial pressure of carbon dioxide gas (P Coz) in equilibrium with an initial solution, plus two in equilibrium with an initial solution, plus two more P CO2 measurements made after adding a known amount of strong base and after further adding boric acid. These three P CO2 measurements, plus the total inorganic carbon concentration are used to compute the total carbonate ion concentration of the original solution, without the use of any system of apparent dissociation constants. Experimental data for seawater samples using this method yield total carbonate ion concentrations in agreement with those calculated using Lyman's agreement with those calculated using Lyman's apparent dissociation constants for carbonic and boric acids. The method can be equally well ap-plied to other saline natural waters. (Knapp-USGS) W73-13063

ENZYMATIC NH3-N DETERMINATION: A SPECIFIC METHOD FOR THE DETERMINATION OF AMMONIA IN WATER AND SEDI-MENTS, Hydrobiologisch Institutt, Nieuwersluis (Netherlands).

For primar W73-13068 rimary bibliographic entry see Field 05A.

NUTRIENT CONTENT OF LITTER FALL ON THE HUBBARD BROOK EXPERIMENTAL FOREST, NEW HAMPSHIRE, New Mexico Univ., Albuquerque. Dept. of Biolo-

gy.
J. R. Gosz, G. E. Likens, and F. H. Bormann.
Ecology. Vol 53, No 5, p 769-784, 1972. Illus.
Identifiers: Cycling, Forests, *Litter fall,
*Nutrients, Seasonality, *New Hampshire (Hubbard Brook Exp. Forest).

Litter fall was collected throughout the year beneath a mature northern hardwood forest in New Hampshire. The material, separated by species and plant part, was analyzed for dry weight and for 11 elements. Total aboveground litter fall and for 11 elements. Total aboveground litter fall averaged 5702 kg/ha per year; leaves, branches, stems, and bark contributed 49.1%, 22.2%, and 14.1% and 1.7% respectively. Other deciduous structures (i.e., bud scales, flowers, fruit), as well as insect frass and miscellaneous tissue, contributed 10.9%. The overstory contributed 98.0% of the total, and shrub and herbaceous layers contributed only 1.2% and 0.8%, respectively. The nutrient content of the litter totaled 140.4 kg/ha per year. The relative abundance was N > Ca > K > Mn > Mg > S > P Zn > Fe > Na > Cu. Nitrogen, Ca, and K accounted for 80.6% of the total, and Zn, Fe, Na and Cu contributed only 0.8%. The overstory, shrub, and herbaceous layers supplied 96.9%, 1.7% and 1.6% of the nutrients, respectively. Litter fall occurred throughout the year, but you have a seen and the seen and the seen and the seen and the seen and seed and seen and see 49.7% of the inter and 30.7% of the nutrients. Summer and winter seasons supplied similar quantities of litter, 21.2% and 22.4%; however, 22.6% of the total nutrient fall occurred during summer compared with only 17.2% during the winter. Spring months supplied 6.7% and 4.1% of litter and nts, respectively. Storms were very impor-the timing of litter and nutrient fall. The extant in the tin treme variability of litter fall is the result of differences between species, tissues, vertical struc-ture of the vegetation, elevation, site and time of year. In spite of this variation, nutrient-budget stu-dies reveal relatively small losses from the

ecosystem. Large fluctuation in rates of nutrient flow, via litter fall, are readily absorbed within the ecosystem, thus preventing nutrient loss and main-taining efficient nutrient cycling.—Copyright 1973, Biological Abstracts, Inc. W73-13100

ANALYSIS OF SOME INORGANIC CON-STITUENTS IN WELL WATERS AND THEIR SEDIMENTS, Dental Coll. Hospital, Lucknow (India). Fluoride Study Unit.

ary bibliographic entry see Field 04B. For primar W73-13151

A SIMPLE COULOMETRIC METHOD FOR THE DETERMINATION OF CHLORIDE IN NATURAL WATER, Oslo Univ., (Norway). Dept. of Chemistry. For primary bibliographic entry see Field 05A. W73-13181

POTASSIUM-SELECTIVE SILICONE-A FUI ASSIUM-SELECTIVE SILICOME-RUBBER MEMBRANE ELECTRODE BASED ON A NEUTRAL CARRIER, Technical Univ. of Budapest (Hungary). Inst. for General and Analytical Chemistry. For primary bibliographic entry see Field 05A. W73-13185

THE DETERMINATION OF SELENIUM IN SEA WATER BY GAS CHROMATOGRAPHY WITH ELECTRON-CAPTURE DETECTION, Okayama Univ. (Japan). Faculty of Science. For primary bibliographic entry see Field 05A. For primary W73-13186

ION-SELECTIVE CARBON-PASTE ELEC-TRODES FOR HALIDES AND SILVER (I) IONS, Technische Hogeschool Twente, Ensci (Netherlands). Dept. of Chemical Technology. For primary bibliographic entry see Field 05A. W73-13187

THE CALIBRATION AND RESPONSE OF ION-SELECTIVE ELECTRODES AT LOW CON-CENTRATIONS OF PRIMARY IONS, Technical Univ. of Budapest (Hungary). Inst. for General and Analytical Chemistry.

P. L. Bailey, and E. Pungor.

Analytica Chimica Acta, Vol 64, No 3, p 423-430, May 1973, 6 fig. 1 tab, 14 ref.

Descriptors: "Calibrations, "Methodology, Electrolytes, Permselective membranes, Volumetric analysis, Chemical analysis, Aqueous solutions, Iodides, Heavy metals, Electric currents, Measurement, Electrolysis.

Identifiers: *Electrochemical behavior, selective electrodes, Copper electrodes, Silver electrode, Iodide electrodes, Unbuffered media, Reproducibility, Accuracy, Electrolytic genera-tion technique, Current efficiencies, Membrane electrodes, Chemical concentration, Coulometry, Silver, Amperometric titration, Potassium perchlorate, Potassium nitrate, sulfate, Zinc sulfate, Perchloric acid.

The responses of silicone-rubber based ion-selective membrane electrodes (iodide and silver ion-selective electrodes) to low concentrations of pri-mary ions have been studied in various unbuffered media. In particular, the failure region of the elecmedia. In particular, the failure region of the elec-trodes was studied. Reproducible and accurately known concentrations of ions (0.1-0.0007 mM) were prepared by electrolytic generation. A neces-sary and integral part of the work was to measure the current efficiency for the generation of the ions in the different media. Such efficiencies were measured coulometrically. Results obtained from the calibration of the iodide-ion selective electrode in various media are presented, and results with the silver and copper ion-selective electrodes are briefly discussed. The advantages of the elec-trolytic generation technique are discussed. (Holoman-Battelle)

RECENT RESULTS ON THE DYNAMIC RESPONSE OF PRECIPITATE-BASED ION-SELECTIVE ELECTRODES, Technical Univ. of Budapest (Hungary). Inst. for General and Analytical Chemistry.

K. Toth, and E. Pungor. Analytica Chimica Acta, Vol 64, No 3, p 417-421, May 1973. 3 fig. 2 ref.

Descriptors: *Mathematical studies, Chemical reactions, Methodology.

Identifiers: *Desolvation, *Ion selective elec-trodes, *Electrochemical behavior, *Data in-terpretation, Copper electrodes, Response time, Characterization, Half-life, Electromotive force.

The e.m.f. vs. time curves of the precipitate-based ion-selective electrodes (copper (II)-selective electrode) have been interpreted mathematically on the basis of the desolvation of ions at the electrode surface. A new method has been suggested for the characterization of ion-selective electrodes by the half life time of the first of the characterization. half-life time of the first-order desolvation reaction. (Holoman-Battelle) W73-13189

EFFECTS OF TEMPERATURE AND CHEMI-CAL TREATMENTS ON THE CHEMICAL COMPOSITION OF ALKALINE WATER, Ministry of Agriculture, Bangkok (Thailand). Rice

For primary bibliographic entry see Field 05G. W73-13191

STUDIES ON SODIUM WATER FOR IRRIGA-TION. EFFECT OF ADDITION OF CATIONS:

Punjab Agricultural Univ., Ludhiana (India). Dept. of Soils.

For primary bibliographic entry see Field 03C. W73-13192

RUGGED SILVER-SILVER CHLORIDE

A RUGGED SILVER SILVER CHLORIDE ELECTRODE FOR FIELD USE, National Oceanic and Atmospheric Administra-tion, Tiburon, Calif. Marine Minerals Technology

For primary bibliographic entry see Field 07B. W73-13193

SOME PROBLEMS ASSOCIATED WITH THE ANALYSIS OF MULTIRESPONSE DATA. Wisconsin Univ., Madison.

For primary bibliographic entry see Field 07C. W73-13195

THE DETERMINATION OF MOLYBDENUM IN SEA WATER BY HOT GRAPHITE ATOMIC AB-SORPTION SPECTROMETRY AFTER CON-CENTRATION ON P-AMINOBENZYLCELL-ULOSE OR CHITOSAN, Bologna Univ. (Italy). Ciamician Chemical Inst.

For primary bibliographic entry see Field 05A. W73-13199

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1968: PART II. PACIFIC SLOPE BASINS IN CALIFORNIA. Geological Survey, Washington, D.C.

Available from GPO, Washington, D.C. 20402. Price \$2.75. Geological Survey Water-Supply Paper 2099, 1972. 359 p, 1 fig, 39 ref.

Descriptors: *Water quality, *Chemical analysis, *Surface waters, *California, Basic data collections, Hydrologic data, Water chemistry, Stream-flow, Flow rates, Sediment transport, Particle size, Sediment yield, Water temperature.

During the water year ending September 30, 1968, the Geological Survey maintained 184 stations on 123 streams in California for the study of chemical and physical characteristics of surface water. Samples were collected daily and monthly at 62 of these locations for chemical-quality studies. Sampies also were collected less frequently at many other points. Water temperatures were measured continuously at 115 and daily at 29 stations. At chemical-quality stations where data are contin ously recorded at the stream site (monitors), the records consist of daily maximum, minimum, and mean values for each constituent measured. Quantities of suspended sediment are reported for 57 stations. Sediment samples were collected one or more times daily at most stations, depending on the rate of flow and changes in stage of the stream. Particle-size distributions of sediments were determined at 54 stations. Daily water temperatures were measured at most of the stations at the time samples were collected for chemical quality or sediment content. (Woodard-USGS) W73-13200

WATER RESOURCES OF BROWARD COUN-

TY, FLORIDA, Geological Survey, Tallahassee, Fla. For primary bibliographic entry see Field 02A.

SEPARATION OF MANGANESE, COBALT, NICKEL, COPPER, ZINC AND CAD-MIUM BY REVERSED-PHASE CHROMATOG-RAPHY USING TRI-N-OCTYLAMINE AS THE STATIONARY PHASE AND APPLYING A GRADIENT ELUTION TECHNIQUE, (EXTRAK-TIONSCHROMATOGRAPHISCHE TRENNUNG VON MANGAN, EISEN, KOBALT, NICKEL, KUPFER, ZINK UND CADMIUM UNTER VER-WENDUNG VON TRI-N-OCTYLAMIN ALS STATIONARE PHASE UND GRADIENTELU-TION), Deutsche Akademie der Wissenschaften zu Ber-

lin, Dresden (East Germany). Central Inst. for Solid Matter Physics and Raw Materials Research. For primary bibliographic entry see Field 05A.

W73-13235

GAS CHROMATOGRAPHY OF TL, SE, TE, HG, AS, SB, BI, SN AS PHENYL COMPOUNDS, (GAS-CHROMATOGRAPHIE VON TL, SE, TE, HG, AS, SB, BI, SN ALS PHENYLVERBINDUN-GEN),

Tieraerztlichen Hochschule, Hanover (West Germany). Chemical Inst. For primary bibliographic entry see Field 05A.

EVIDENCE FOR BUFFERING OF DISSOLVED

SILICON IN FRESH WATERS, University of East Anglia, Norwich (England). School of Environmental Sciences. For primary bibliographic entry see Field 05B. W73-13238

ATOMIC EMISSION SPECTROMETRY WITH AN INDUCTION-COUPLED HIGH-FREQUENCY PLASMA SOURCE. THE DETERMINA-TION OF IODINE, MERCURY, ARSENIC AND SELENIUM

perial Coll. of Science and Technology, Lon (England). Dept. of Chemistry. For primary bibliographic entry see Field 05A. W73-13254

PRECISE SHIPBOARD DETERMINATION OF PRECISE SHIPBOARD DETERMINATION OF DISSOLVED NITROGEN, OXYGEN, ARGON, AND TOTAL INORGANIC CARBON BY GAS CHROMATOGRAPHY, Institution of Oceanography, La Jolla, Calif. For primary bibliographic entry see Field 05A. w27.12326.

For primar W73-13255

ATOMIC FLUORESCENCE SPECTROMETRY WITH A GRAPHITE ROD ATOMIZER AND THERMOSTATED ELECTRODELESS DISCHARGE LAMPS, Florida Univ., Gainesville. Dept. of Chemistry. For primary bibliographic entry see Field 05A. W73-13260

APPLICATION OF A SULFATE-SENSITIVE ELECTRODE TO NATURAL WATERS, Texas Instruments, Inc., Dallas. For primary bibliographic entry see Field 05A. For primar W73-13276

DETERMINATION OF NITROGEN-15 BY CHEMICAL IONIZATION MASS TROMETRY, Rockefeller Univ., New York. For primary bibliographic entry see Field 05A.

CHROMATOGRAPHY OF 48 METAL IONS ON STANNIC ARSENATE AND PLAIN PAPERS IN BUTANOL-NITRIC ACID MEDIA, Z. H. Coll. of Engineering and Technology, Aligarh (India). For primary bibliographic entry see Field 05A. W73-13281

MICRO AND SEMIMICRO DETERMINATION OF THIOLS WITH ION-SELECTIVE ELEC-TRODES, California Univ., Livermore. Lawrence Liver-

more Lab. For primary bibliographic entry see Field 05A.

CHEMICAL COMPOSITION OF OCEAN USING

A DIRECT MEASURING OCEANOGRAPHIC ELECTROCHEMICAL PROBE, California Univ., Los Angeles. Dept. of Geology. I. R. Kaplan, and S. Ben-Yaakov. Available from the National Technical Informa-

roan de roan de randa l'echnical informa-tion Service as UCLA-34-P-178-X-3, \$3.00 in paper copy, \$1.45 in microfiche. Final Report 1972. 156 p, 5 fig, 3 tab, 38 ref. AEC AT (04-3)-34.

Descriptors: "Sea water, "Chemical analysis, Electrochemistry, Hydrogen ion concentration, Pacific Ocean, Mixing, Carbon dioxide, Dissolved oxygen, Saline water, On-site investigations, Aquatic productivity, Methodology. Identifiers: "Electrochemical probe, Ionic diffusion, Carbonate saturation, Chemical composition Glasse electrodes."

tion, Glass electrodes.

These studies were primarily concerned with the investigation of carbonate saturation in the ocean by the application of an in situ probe. The method involved the construction of an electrochemical measurement system which was used to depths of 4,500 m. A glass electrode was allowed to reach equilibrium with a calcium carbonate suspension and the changes in pH were measured. This pH change could then be related to the degree of saturation of the carbonate in seawater. Studies also were undertaken to measure ionic diffusion from seawater to less dilute solutions. It was established scaware to less unter solutions. It was established that ionic complexing may extensively modify the fluxes of migrating ions. Theoretical studies were conducted on the effect of complexing on the ap-parent dissociation constants in the carbonate system. It was shown that these could change sig-

Group 2K—Chemical Processes

nificantly in interstitial waters having approxi-mately the same ionic strength of seawater, but a different composition. A study was also made of the CO2-O2 system in the North Eastern Pacific. Variations in CO2 and O2 were related to produc-tion and consumption rates and to mixing models of ocean currents. (Mortland-Battelle) W73.13244

IN SITU ACTIVATION ANALYSIS OF MARINE SEDIMENTS WITH CALIFORNIUM-252, Battelle Memorial Inst., Richland, Wash. Pacific Northwest Labs.

N. A. Wogman, H. G. Rieck, Jr., J. R. Kosorok, and R. W. Perkins.

Available from the National Technical Informa-

tion Service as BNWL-SA-4434, \$3.00 in paper copy, \$1.45 in microfiche. Report No CONF-721010-4, September 1972. 14 p, 2 fig, 2 tab, 9 ref.

Descriptors: *Neutron activation analysis, *Sediments. *On-site investigations. *Metals. ments, *On-site investigations, *Metals, *Halogens, Sulfur, Calcium, Chlorine, Molybdenum, Magnesium, Aluminum, Iron, Potassium, Sodium, Nickel, Cobalt, Copper, Tin, Titanium, Bromine, Iodine.

Bromine, Iodine.

Bromine, Iodine.

Bromine, Iodine.

Bromine, Cf-252, Nuclear probe, Indium, Gallium, Neodymium, Barium, Vanadium, Europium, Columbium, Tungsten, Antimony, Dysprosium, Silver, Osmium, Rhodium, Platinum, Lanthanum, Iridium, Arsenic.

A seabed nuclear probe has been developed which permits the measurement of up to 33 elements at the parts per thousand to parts per million levels in continental shelf areas. These elements include S, Ca, Cl, Mo, Mg, Al, F, K, Na, In, Ga, Nd, Ni, Co, U, Ba, Sn, V, I, Eu, Ti, Cb, W, Sb, Dy, Ag, Os, Br, Rh, Pt, La, Ir, and As. The probe consists of a neutron irradiation source, californium-252, which neutron activates the elements in the minerals of interest. These resulting radio-active elements emit characteristic gamma radiation which is analyzed in situ in 2- to 10-minute counting inter-vals with a Ge (Li) detector system. Details of the irradiation source, the Ge (Li) detector, and spectra taken in situ in a marine environment are discussed with respect to the detection of the minerals at concentrations of economic interest. (Little-Battelle) W73-13295

IMPROVED WATER ANALYSIS KIT, Franklin Inst. Research Labs., Philadelphia, Pa. For primary bibliographic entry see Field 07B. W73-13297

ON MULTIDISCIPLINARY RESEARCH ON THE APPLICATION OF REMOTE SENSING TO WATER RESOURCES PROBLEMS Wisconsin Univ., Madison, Inst. of Environmental Studies.

For primary bibliographic entry see Field 05A. W73-13299

RELATIONSHIP BETWEEN THE CARBON ISOTOPE COMPOSITION OF SOIL CO2 AND

ISOTOPE COMPOSITION OF SOIL CO2 AND DISSOLVED CARBONATE SPECIES IN GROUNDWATER, Geological Survey, Washington, D.C. C. T. Rightmire, and B. B. Hanshaw. Water Resources Research, Vol 9, No 4, p 958-967, August 1973. 4 fig, 3 tab, 29 ref.

Descriptors: *Stable isotopes, *Carbon, *Isotope fractionation, *Water chemistry, *Hydrogeology, Groundwater, Groundwater movement, Provenance, Climatology, Tracers, Florida, Soil water, Soil gases.
Identifiers: *Carbon isotopes.

To understand the carbonate geochemistry of an aquifer system, it is helpful to determine the

sources of carbon in the dissolved carbonate spesources of caroon in the dissolved caroonate spe-cies. Samples of ground litter, soil organic matter, soil CO2, and groundwater were collected in the area of recharge to the principal artesian aquifer of central Florida and were analyzed for C-13 con-tent. Analytical results yield consistent C-13/C-12 tent. Analytical results simplycet for C-13 content. Analytical results yield consistent C-13/C-12 values for soil organic matter; delta C-13 (PDB) z 39 plus or minus 1 part per thousand. The C-13/C-12 ratio of the litter samples ranges from delta C-13 (PDB) of -18.2 to -29.5 parts per thousand and indicates the presence of both Calvin and Hatch-Slack cycle plants. The C-13/C-12 of the soil CO2 ranges from -14.7 to -21.3 parts per thousand, which is consistent with the trend observed in the litter. The relationship between C-13/C-12 of the dissolved carbonate and the percent calcite saturation indicates that the C of the source CO2 is within the range expected for a humid, subtropical environment. (Knapp-USGS)

HYDROCHEMICAL ENVIRONMENTS OF CARBONATE TERRAINS.
McMaster Univ., Hamilton (Ontario). Dept. of Geography.

J. J. Drake, and R. S. Harmon.

Water Resources Research, Vol 9, No 4, p 949-957, August 1973. 4 fig, 4 tab, 22 ref.

Descriptors: *Karst hydrology, *Water chemistry, Water analysis, Geochemistry, Statistics, Carbonate rocks, Hydrogeology, *Pennsylvania.

Waters within a carbonate aquifer may be classified on a hydrologic basis. To test the classification method, 166 reliable chemical analyses of carbonate waters from Pennsylvania were grouped on a hydrologic basis, and the groupings were tested by a stepwise linear discriminant function analysis. Two parameters (degree of calcite saturation and equilibrium carbon dioxide partial pressure) are sufficient to distinguish the groups at the 0.005 confidence level and provide a reliable way to examine the geochemical evolution of the wate the carbonate drainage basin. (Knapp-USGS) W73-13361

ON THE UPTAKE OF TRITIUM BY SOIL WATER AND GROUNDWATER,
National Center for Atmospheric Research, Boulder, Colo. For primary bibliographic entry see Field 02F. W73-13372

SIMULTANEOUS TRANSPORT OF SOLUTES AND WATER UNDER TRANSIENT UNSATURATED FLOW CONDITIONS,

Volcani Inst. of Agricultural Research, Bet-Dagan (Israel). Dept. of Soil Physics. For primary bibliographic entry see Field 02G. W73-13380

EFFECT OF SOLUTE DISPERSION ON THER-MAL CONVENTION IN A POROUS MEDIUM LAYER, Technion-Israel Inst. of Tech., Haifa. Dept. of

Civil Engineering.
For primary bibliographic entry see Field 02F.
W73-13381

EIGHTEENTH ANNUAL CONFERENCE ON BIOASSAY, ENVIRONMENTAL AND ANALYTICAL CHEMISTRY, OCT. 10-11, 1972, ANALYTICAL CHEMISTRY, OCT. 16-11, I PROGRAM AND ABSTRACTS. Argonne National Lab., Ill. For primary bibliographic entry see Field 05A. W73-13415

CATION INTERACTION BLISTER-LIKE OSMOTIC SWELLING ON VERMICULITE CLEAVAGES. Wisconsin Univ., Madison. Dept. of Soil Science.

For primary bibliographic entry see Field 02G. W73-13425

ON PROPERTIES OF SEAWATER DEFINED BY TEMPERATURE, SALINITY AND PRESSURE, Yale Univ., New Haven, Conn. Dept. of Geology d Geophysics.

Journal of Marine Research, Vol 30, No 2, p 227-255, 1972. 17 fig, 6 tab, 14 ref. NSF GA 11410.

Descriptors: "Temperature, "Salinity, "Pressure, "Mathematical models, "Ocean circulation, Oceanography, Seawater, Model studies, Atlantic Ocean, Data collections, Deep-water habitats, Hydrologic equation, Graphical analysis, Data processing, Density.

Hydrographic station data consisting principally of temperature and salinity determinations probably contain substantially more information than has been derived from them in the past. The quantity that is orthogonal to potential-density curves in the Theta S plane is suggested as a useful variable to complement the information contained in potential density. A polynomial expression that is suitable for computer calculations is derived from hydrographic station data. Examples of hydrographic graphic station data. Examples of hydrographic data from the Atlantic are plotted on an orthogonal variable - potential density diagram showing many features exhibited in the temperature-salinity plane. Vertical sections of the variable provide inplane. Vertical sections of the variable provide in-formation about mixing in different parts of the Atlantic. The variable may serve as a good tracer for abyssal water movements. An exploration of the dynamical significance of potential density is presented beginning with the question of stability of abyssal water. Examples show that analysis of potential density alone can lead to incorrect conobscibled the service of the service Vanderbilt) W73-13477

OCEANIC SEDIMENTS AND THEIR DIAGENE-SIS: SOME EXAMPLES FROM DEEP-SEA DRILLING, Scripps Inst. of Oceanography, La Jolla, Calif. Deep Sea Drilling Project. For primary bibliographic entry see Field 02J. W73-13542

ESTIMATING WATER QUALITY FROM ELEC-TRICAL LOGS, Geological Survey, Baton Rouge, La. For primary bibliographic entry see Field 04B. W73-13556

ANALYTICAL APPLICATIONS POLYAMINE-POLYUREA CHELATING RESINS, Massachusetts Univ., Amherst.

For primary bibliographic entry see Field 05A. W73-13571

WATER: EXAMINATION, ASSESSMENT, CON-DITIONING, CHEMISTRY, BACTERIOLOGY, BIOLOGY, For primary bibliographic entry see Field 05A. W73-13573

CHANGE IN THE FREE AMINO ACID CON-TENT IN CRYPTOMERIA JAPONICA TRANS-PLANTS UNDER VARIOUS SOIL MOISTURE CONDITIONS, Government Forest Experiment Station, Tokyo

(Japan). T. Mori, Y. Sakagami, and K. Doi. J Jap For Soc. Vol 53, No 11, p 350-354, 1971. Illus.

Identifiers: Alanine, *Amino acid, Aspartic-acid, Chromatography, *Cryptomeria-Japonica, Glu-tamic-Acid, Metabolism, Proline, *Soil moisture,

Frunteen amino acids and 2 amides were separated from 80% ethanol extracts of the shoots and roots by the paper chromatographic method. Alanine, proline, aspartic and glutamic acids comprised 70 approximately 80% of the total amino acids. In the shoots, the total amino acid concentration increased until the water content in the shoots declined to about 120%. Further decline of water content did not cause any significant change in the total amino acid concentration. In the roots, the concentration continued to increase during the decrease of water content. Alanine and proline in the shoots increased under water stress with water content lower than 120%, while almost all other amino acids decreased after they reached the maximum levels at about 120% of the water content. Proline in the upper shoots increased, more than Proline in the upper shoots increased, more than 10-fold of the original level, with the decrease of water content. Moderate soil moisture deficit caused an extreme decrease of water content in lants, and water stress in the transplants seemed to strongly influence the amino acid metabolism.-Copyright 1973, Biological Abstracts. Inc.

HYDROLOGICAL CHEMICAL AND PHYSICAL INVESTIGATIONS ON THE ADIGE RIVER AT BOARA PISANI. JUNE 1968-JUNE 1970, Istitute di Biologia del Mare, Venice (Italy).

V. U. Fossato.
Arch Oceanogr Limnol. Vol 17, No 2, p 105-123.
1971. Illus. English summary.
Identifiers: Chemical studies, Hydrological studies, *Italy (Adige River), Minerals, *Nutrients,
Physical studies, Rivers, *Calcium, *Magnesium.

The nutrients of the river Adige to the Adriatic Sea and the seasonal variations of alkalinity and of Ca and Mg concentrations were investigated bimonthly for 2 yr Boara Pisani. Statistically significant correlations between the flow of the river and the concentrations of some nutrients (nitrites, nitrates and phosphates) could be shown. The nutrient concentrations and the relative oxygenanutrient concentrations and the relative oxygena-tion seemed to indicate a low pollution level in this river. A correlation was also found between the seasonal changes in total alkalinity, in Ca and Mg concentrations, and in the flow and temperature of the river. This is explained by the hypothesis that CO2 causes a slow transformation of the insoluble carbonates into soluble bicarbonates.—Copyright 1973, Biological Abstracts, Inc. W73-13596

HYDROLOGICAL, CHEMICAL AND PHYSI-CAL INVESTIGATIONS ON THE PO RIVER AT POLESELLA: JUNE 1968-JUNE 1970, Istituto di Biologia del Mare, Venice (Italy).

V. U. Fossato.
Arch Oceanogr Limnol. Vol 17, No 2, p 125-139.
1971. English summary.
Identifiers: Chemical studies, Hydrological studies, Minerals, *Nutrients, Physical studies, Rivers, *Italy (Po River), *Calcium, *Magnesium.

The nutrients of the Po River to the Adriatic Sea and the seasonal variations in alkalinity and in Ca and Mg concentrations were investigated bimonthly for 2 yr at Polesella. The nutrient con-centrations were very variable. A correlation existed between the seasonal changes in total al-kalinity and in Ca and Mg concentrations, and in flow and temperature of the river.—Copyright 1973, Biological Abstracts, Inc. W73-13598

DETERMINATION OF MERCURY IN GEOLOGIC MATERIALS BY FLAMELESS ATOMIC ABSORPTION SPECTROMETRY, Geological Survey, Washington, D.C.

For primary bibliographic entry see Field 05A. W73-13649

21. Estuaries

THE COASTAL ZONE AS AN INTEGRAL ELE-MENT OF WATER-RESOURCE SYSTEMS, Florida State Univ., Tallahassee. Dept. of Urban and Regional Planning. A. A. Dzurik.

Water Resources Bulletin, Vol 9, No 4, p 735-745, August 1973. 3 fig, 3 tab, 10 ref.

Descriptors: *Coasts, Water management (Applied), *Estuaries, *Planning, Water resources development, Comprehensive planning, Multiple-purpose projects.

The coastal zone is subject to more severe problems and complex issues than more narrowly-defined land and water resources. It must be viewed as an important component of water-resource systems. Generally defined, the coastal zone is the area of transition from land to sea, and from freshwater to saltwater. Estuaries are the key element of this zone and are the world's reco element of this zone and are the world's most biologically productive water bodies. Freshwater flow has impact upon the characteristics and quali-ty of estuarine waters, and upon sedimentary deposits along the coast. Man has and will con-tinue to concentrate his activities and cities along the coasts. The uses of coastal resources are varied and often conflicting, and thus coastal-zon varied and often conflicting, and thus coastal-zone planning and management is necessary. Rational determination of public policy for the coastal zone must recognize factors relating to (a) physical, chemical, and biological characteristics, (b) urbanization and development, and (c) governmental capacity for adequate policies and programs. Inherent is the realization that neither complete exceptions is answerights, or several content of the complete exceptions of the complete exception is answerights, or several content of the content of th ploitation nor preservation is appropriate or practicable. A balance must be maintained to maximize long-term as well as immediate benefits through appropriate management of coastal resources within the framework of water-resource systems. (Knapp-USGS) W73-13036

EXTENSIVE OXYGEN DEPLETION IN MO-

BILE BAY, ALABAMA, Alabama Marine Resources Lab., Dauphin Island. For primary bibliographic entry see Field 05C. W73-13065

AMONG COMPETITION FOR UREA ESTUARINE MICROORGANISMS, Woods Hole Oceanographic Institution, Mass. For primary bibliographic entry see Field 05C. W73-13108

STUDIES ON VIBRIO PARAHAEMOLYTICUS IN KOREAN COASTAL WATERS: I. THE DIS-TRIBUTION OF V. PARAHAEMOLYTICUS (IN

ROREAN), Pusan Fisheries Coll. (Republic of Korea). For primary bibliographic entry see Field 05B. W73-13118

PRUBLEMS OF WATER RESOURCE DEVELOPMENT IN THE GULF COAST ESTUARINE ZONE, Forest Service

Forest Service (USDA), New Orleans, La. Southern Forest Experiment Station.

L. C. Irland, and J. W. Tarver.

In: Proceedings (Vol. II), International Symposium on Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tucson, December 11-14, 1972. p 738-753, (1972). 2 fig, 3 tab, 25 ref.

Descriptors: *Estuarine environment, *Mississippi River, *Gulf of Mexico, *Louisiana, *Water

resources development, "Ecosystems, "Planning, Economics, Legal aspects, Hydrology, Deltas, Environmental engineering, Public rights, Govern-ments, "Risks. ments, *Kisks. Identifiers: Human activities.

Identifiers: Human activities.

The Gulf Coast Estuarine Region, based upon the Delta of the Mississippi River, is one of the world's largest and most productive estuaries. Connected by water input from streams and the ebb and flow of tides, the region is an ecological unit. Human activities, including trade, manufacturing, and oil production, have altered natural flow patterns and reduced estuarine productivity. Purposeful coordinated planning is needed, but even if it were established, severe uncertainties would remain: (1) Uncertain knowledge, including ignorance of basic hydrologic and biological proceases in the region, hindering evaluation of project effects on the estuarine system; (2) uncertain prediction, concerning primarily the difficulty of forecasting economic activity in the area, hindering evaluation of project benefits; and (3) uncertain control (legal) over resource users, complicating comprehensive planning. The resources of the Gulf Coast region, the current activities of man in the area, and their ecological impact are described. Also described are the uncertainties are described. Also described are the uncertainties of economic prospects, legal relations that affect resource planning, and priority research needs; the implications of these uncertainties are considered. Possible adjustments to uncertainties are described, including research expansion, setting of safe minimum standards, and establishment of statewide land use control. (See also W73-13134) (Bell-Cornell)

TRENDS IN METHODOLOGY FOR EVALUA-TION OF EFFECTS OF POLLUTANTS ON MARINE ORGANISMS AND ECOSYSTEMS, Fisheries Research Board of Canada, West Van-couver, (British Columbia). Pacific Environment Inst.

For primary bibliographic entry see Field 05C. W73-13171

INORGANIC NITROGEN REMOVAL FROM WASTEWATER: EFFECT ON PHYTOPLANK-TON GROWTH IN COASTAL MARINE

WATERS, Woods Hole Oceanographic Institution, Mass. For primary bibliographic entry see Field 05C. W73-13179

BRIEF FIELD GUIDE TO INTERTIDAL SEDI-MENTS, MINAS BASIN, NOVA SCOTIA, McMaster Univ., Hamilton (Ontario). Dept. of

Geology. G. V. Middleton. Maritime Sediments, Vol 8, No 3, p 114-122, December 1972. 4 fig, 35 ref.

Descriptors: *Sediments, *Tides, ransport, Canada, Currents (Water), Tidal waters, Tidal effects.
Identifiers: *Bay of Fundy, *Minas Basin.

The Bay of Fundy is famous for its tides which are reputed to have the greatest range of any in the world. The cause of the very large tidal range is resonant amplification of the semidiurnal tidal component. The resonant condition is critically dependent on the dimensions of the Bay, and these dimensions must have been achieved only during the last 4,000 years. Changes in sea level have considerably affected tidal amplitude. The main growth in tidal amplitude took place as the bay both widened and, on the average, shallowed with the main effect due to shallowing some 4,000 to 1,000 years ago. Much of the apparent rise in sea level may therefore be due to increasing tidal amplitude (and therefore rise in the higher high water level that is used as a sea level datum). However,

Group 2L—Estuaries

there is still an excess rate of subsidence of 7-9 there is still an excess rate of subsidence of 19-cm/100 years. Depths in the Minas Passage reach 400 ft but are generally not more than 30 ft within the basin itself. Tidal velocities are extreme in the Minas Passage, reaching 11 knots, are generally 3 to 4 knots in the open basin, and decrease near the shore to a maximum of 1 to 3 knots over the main shore to a maximum of 1 to 5 knots over the main sand bodies. Much of the Minas Passage is under-lain by bedrock, swept bare of sediment by the strong tidal currents. The general distribution of modern intertidal sediments in the Minas Basin-Cobequid Bay is reviewed. (Knapp-USGS) Cobequid I W73-13204

RECONNAISSANCE SURVEY OF HOG ISLAND, PRINCE EDWARD ISLAND, McMaster Univ., Hamilton (Ontario). For primary bibliographic entry see Field 02J. W73-13205

BARRIER ISLANDS, SAND SPITS AND DUNES IN THE SOUTHERN GULF LAWRENCE, McMaster Univ., Hamilton (Ontario).

For primary bibliographic entry see Field 02J. W73-13206

A NOTE ON WIND AND WAVE CONDITIONS IN THE SOUTHERN GULF OF ST. LAWRENCE,

LAWRENCE, McMaster Univ., Hamilton (Ontario). E. A. Bryant, and S. B. McCann. Maritime Sediments, Vol 8, No 3, p 101-103, December 1972. 2 fig. 1 tab, 3 ref.

Descriptors: *Waves (Water), *Ocean waves, Beach erosion, Winds, Surf, Refraction (Water waves), Fetch. Identifiers: *Gulf of St. Lawrence.

The Gulf of St. Lawrence is connected to the Atlantic via two narrow straits-the Strait of Belle Isle to the northwest and Cabot Strait to the eastbut the important waves are generated within the out in important waves are generated within the Gulf rather than entering from the open ocean via these straits. Wave systems tend to be concen-trated on particular stretches of coastline due to wave refraction in the southern part of the Gulf. The prevalent winds blow from between south and northwest, accounting for 58% of total wind directions but only 40% of maximum wind speeds for each month. The strongest winds come from between north and east-southeast. The significance of this pattern is that the prevalent winds are offshore on the open gulf sandy coasts of New Brunswick and Prince Edward Island, and that there are many periods when wave action is rela-tively light. However, the strongest winds, though less frequent, blow over long fetches generating the dominant waves, which are of low frequency but large magnitude. (Knapp-USGS) W73-13207

ENVIRONMENTAL APPLICATION OF REMOTE SENSING METHODS TO COASTAL ZONE LAND USE AND MARINE RESOURCE

MNAGEMENT, Virginia Univ., Charlottesville. Dept. of Environ-mental Sciences.

H. G. Goodell, C. M. Woolheater, and K. L.

H. G. Goodell, C. M. Woolneater, and K. L. Echtermacht.
Available from NTIS, Springfield, Va 22151 as PB-214 547 Price \$3.00 printed copy; \$1.45 microfiche. Geological Survey Interagency Report USGS-243, September 1972. 132 p, 24 fig, 33 tab, 28 ref. NASA W-13165, Task 160-75-01-32-10-, USGS 14-08-001-12540.

Descriptors: *Remote sensing, *Land manage-Descriptors: Remote sensing, "Land manage-ment, "Land use, Environment, Coastal plains, Aerial photography, Mapping, Topography, Data collections, Erosion, Water pollution sources, Cli-matic data, Census, Soil environment, Water resources, Surface water, Groundwater, Reviews. Identifiers: *Central Atlantic coastal zone, Marine

The potential of remote sensing both as a source of data and as the basis for an information system for and potential or remote sensing both as a source of data and as the basis for an information system for resource analysis and management within the coastal zone is described. Criteria are presented for a computer based model for forecasting the environmental consequences of resource allocations involving land use decision. Its ultimate efficiency will depend on the accuracy of the algorithms which link land use to a specific environmental impact and on the identification of the synergistic effects of these impacts. Two major data sources are used: land use data as identified principally by remote sensing, and dynamic climatological data be developed from the National Weather Records Center of NOAA. The demonstration project suggests the establishment of RICHEL, an environmental laboratory, wherein the impact algorithms initially used in forecasting could be verified by field data so that the precision of the algorithms could be refined. (Woodard-USGS)

MARINE MICROBIOLOGY, FIVE-YE PROGRESS REPORT, 1967-1972, Woods Hole Oceanographic Institution, Mass. For primary bibliographic entry see Field 05A. W73-13339 FIVE-YEAR

MARINE SCIENCES. Battelle-Pacific Northwest Labs., Richland, Wash. Ecosystems Dept.
For primary bibliographic entry see Field 05B.
W73-13343

THE USE OF WATER QUALITY SIMULATION MODELS IN THE ANALYSIS OF THE THERMAL EFFECTS PROBLEM, RAND Corp., Santa Monica, Calif. For primary bibliographic entry see Field 05B. W73-13479

HEAVY MINERAL CONCENTRATING PROCESSES AND DENSITY/SHAPE/SIZE PROCESSES AND DENSITY/SHAPE/SIZE EQUILIBRIA IN THE MARINE AND COASTAL OF THE APALACHICOLA, DUNE SANDS

FLORIDA, REGION,
Florida State Univ., Tallahassee. Dept. of Geolo-Journal of Sedimentary Petrology, Vol 43, No 2, p 396-407, June 1973. 4 fig, 5 tab, 16 ref.

Descriptors: *Mineralogy, *Sands, *Beaches, *Dunes, *Sediment transport, Sediment sorting, Specific gravity, Particle shape, Particle size, Winds, Surf, Littoral drift, *Florida, Gulf of Mex-

Identifiers: *Heavy minerals, Apalachicola (Fla).

Two marine concentrating processes operate to produce the heavy mineral deposits found on beaches in the vicinity of Appalachicola, Florida. The process operating in the more energetic Gulf of Mexico tends to remove the coarser grains from initial populations. This results in a relatively fine-grained black sand concentrate being delivered to the beach for deposition. The reverse occurs in the less energetic bays and sounds; the process tends to remove the finer grains and the deposits are coarser. The quartz associated with both types of deposits is in equilibrium, but not settling equivalence, with ilmenite, staurolite, and kyanite. Settling equivalence is present among the ilmenite. staurolite, and kyanite populations of the sheltered beach deposits only. Zircon and rutile are too small in grain size to be in equilibrium with the sman in grain size to be in equilibrium with the other minerals; this probably reflects smaller variances of the initial populations. The dune deposits were concentrated by gentler-than-normal winds reworking beach sands containing areally limited heavy mineral deposits. Ilmenite, staurolite, kyanite, and quartz are in settling equivalence; the zircon and rutile are too small. Good evidence ex-ists for a shape-based decrease in grain size for kyanite and rutile during wind transport. (Knapp-W73-13540

HYDRAULIC SAND-MODEL STUDY OF THE CYCLIC FLOW OF SALT WATER IN A COASTAL AQUIFER, Geological Survey, Phoenix, Ariz. J. M. Cahill.

lapse photography.

Geological Survey Professional Paper 575-B, p B240-244, 1967. 4 fig, 5 ref.

Descriptors: *Saline water-freshwater interfaces, *Model studies, *Tracers, Tidal waters, Saline water intrusion, Hydraulic models. Identifiers: *Coastal acquifers, *Zone of diffusion, Nonoscillatory motion, Oscillatory motion, Time-

Model studies demonstrate visually that 'cyclic flow' takes place in the denser fluid when fresh flow' takes place in the denser fluid when fresh water seaward over intruding ocean water. When tidal fluctuations are simulated in the model by alternately raising and lowering the level of the free body of salt water, additional mixing of the two miscible fluids occurs and additional salt water is transported into the fresh-water region. The fluid movement was observed by following colored tracers that were injected into both fluids. These trudies indicate that the decrea of all water interstudies indicate that the degree of salt-water intru-sion is controlled primarily by the flow of the fresh water rather than by tidal effects. (Campbell-NWWA) W73-13558

CHANGES DURING FOUR YEARS IN THE AQUATIC MACROVEGETATION IN A FLAD IN NORTHERN STOCKHOLM ARCHIPELAGO, Umea Univ. (Sweden). Dept. of Biology. For primary bibliographic entry see Field 05C. W73-13580

03. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

WATER FROM GEOTHERMAL RESOURCES, California Univ., Berkeley. Sea Water Conversion

A. D. K. Laird. In: Geothermal Energy-Resources, Production, Stimulation; Proceedings of Special Symposium of American Nuclear Society, June 19-20, 1972: Stanford University Press, Stanford, Calif, p 177-196, 1973. 5 fig. 3 tab. 11 ref.

Descriptors: *Desalination, *Geothermal studies, *Electric power, Thermal powerplants, Economics, Distillation, Water resources develop-ment, Energy, Water sources. Identifiers: *Geothermal power.

Geothermal energy is a potentially clean source of large amounts of power. Water carries thermal energy from the reservoirs to the surface. In some cases, condensate from steam turbines may be available as freshwater supplies. Distillation is a means of using geothermal energy for making more freshwater available. Consequently, largescale geothermal distallation is a component of several energy production schemes. (See also W73-13214) (Knapp-USGS)

APPARATUS FOR DISTILLATION OF FLUIDS,

WATER SUPPLY AUGMENTATION AND CONSERVATION—Field 03

Use of Water of Impaired Quality—Group 3C

U.S. Patent No. 3,741,879, 5 p, 7 fig, 13 ref; Official Gazette of the United States Patent Office, Vol 911, No 4, p 1417, June 26, 1973.

Descriptors: "Patents, "Distillation, "Evapora-tion, "Condensation, "Desalination, Sea water, Saline water, Salt water, Separation techniques, Potable water, Equipment.

The evaporation and condensation unit comprises a vertical outer shell with horizontal partitions dividing the shell's interior into an upper vapor distribution region, and intermediate heat transfer region and a lower condensate collection region. Heat transfer tubes extend vertically through these regions. There is a sump near the bottom of the heat transfer region for containing liquid which flows down along the outer surfaces of the tubes. Fluids are subjected to distillation by causing vapors to pass vertically through the tubes while a cooler liquid film flows over the outside of the tubes. The vapors condense and give up heat to the liquid film causing a portion to vaporize. A vapor outlet is mounted in the shell to permit emission of the vapors. (Sinha-OEIS)

PROCESS AND SYSTEM FOR EXTRACTING SALTS, CONCENTRATED BRINE, AND/OR PURE WATER FROM SALINE WATER. Hydro Chemical and Mineral Corp., New York. (assignee) A. Osdor.

U.S. Patent No. 3,741,878, 11 p, 13 fig, 3 tab, 10 ref; Official Gazette of the United States Patent Office, Vol 911, No 4, p 1417, June 26, 1973.

Descriptors: "Patents, "Desalination, "Evapora-tion, "Condensation, Saline water, Brine, Salt water, "Water treatment, "Flash distillation, Heat transfer, Sea water, Potable water, Salts.

A system is described for flash distillation of a liquid mixture including saline water and an immiscible liquid having both a different density and a lower vapor pressure. The liquids are intimately mixed and continuously remixed during passage through each evaporator stage and U-tube coanections so that heat transfer is maintained between the immiscible liquid and saline water droplets accompanying flashing. The liquids flow with turbulence and at a velocity to maintain the intimate mixing. A quanity of the solvent is vaporized while the immiscible liquid remains in the liquid state, thereby cooling the resultant mixture. The cooled immiscible liquid is separated from the cooled residual solution. The immiscible liquid is reheated by causing it to flow down by gravity through a se-A system is described for flash distillation of a residual solution. The immiscible liquid is reheated by causing it to flow down by gravity through a series of condensers disposed at decreasing elevations as solvent evaporated from the solution is condensed. The condensers display increasing temperature and pressure conditions with decreasing elevation. The immiscible liquid is separated from the condensed solvent leaving the condenser. Pure water is vaporized until substantially all of the CaCO3 and most of the CaSO4 is precipitated with the remaining CaSO4 being in super-saturated solution. Precipitated salts settle out and the resultant mixture is fed into a settling tank where remaining salts settle out and the immiscible liquid is separated out. (Sinha-OEIS)

MULTI-STAGE FLASH DISTILLATION PROCESS,

A. R. Spicacci U.S. Patent No 3,734,835, 5 p, 6 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 910, No 4, p 1307, May 22, 1973.

Descriptors: *Patents, *Desalination, *Descaling, *Flash distillation, Separation techniques, *Water purification, Water quality, *Evaporators, *Heat exchangers, Treatment, Equipment.

Feed liquid, progressively preheated by passage along a primary flow path in heat exchange rela-tion with vapor zones of successively staged flash evaporation chambers, is diverted from at least evaporation chambers, is diverted from at least one region of the primary flow path directly into an associated flash liquid zone having a flash liquid temperature equal to the temperature of the feed liquid. Some of the streams are treated with scale inhibitor. Each stream is diverted from the primary flow path when the preheated liquid in the stream attains a temperature slightly below the temperature at which scale deposition tends to oc-cur. (Sinha-OEIS) W73-13336

3B. Water Yield Improvement

ENGINEERING HYDROLOGY, Oregon State Univ., Corvallis. Water Resources Research Inst.

P. C. Kingeman.

Available from the National Technical Information Service as PB-222 608, \$3.00 in paper copy, \$1.45 in microfiche. Project completion report, June 1973. 36 p, 19 ref. OWRR A-001-ORE (19).

Descriptors: Hydrology, "Water yield, "Water shed management, Measurements, "Sediment transport, "Gravels, Spawning, "Oregon, "Silts, "Forecasting, Anadromous fish.

Results are summarized of a six-year study dealing with the engineering aspects of the hydrology of water yield prediction and related problems. The study emphasized (a) the identification of critical problem areas for hydrologic research in Oregon, (b) the planning, development, and coordination of interdisciplinary research and education in interdisciplinary research and education in hydrology, (c) investigation of the influence of landform and precipitation parameters on the water yield from watersheds, (d) prediction of water yield from watersheds in the Oregon Coast Range, (e) sediment transport in coarse-bedded streambeds to provide spawning areas for anadromous fish, and (g) control of siltation in artificially developed spawning channels.

W73-13016

THE SENSITIVITY OF RETURN PERIODS TO VARIATIONS IN RETENTION LEVELS FOR DIFFERENT DEFINITIONS OF SHORTAGE, Lancaster Univ., Bailrigg (England). For primary bibliographic entry see Field 04A. W73-13162

PRODUCTIVITY OF TALL WHEATGRASS AND GREAT BASIN WILDRYE UNDER IR-RICATION ON A GREASEWOOD-RABBITBRUSH RANGE SITE, Agricultural Research Service, Reno, Nev. Plant

nce Research Div.

R. E. Eckert, Jr., A. D. Bruner, and G. J. Klomp. Journal of Range Management, Vol 26, No 4, p 286-288, July 1973. 2 tab, 7 ref.

Descriptors: *Phreatophytes, *Forage grasses, *Wheatgrass, *Productivity, *Nevada, Rabbitbrush, Ranges, Crop production, Crop response, Planting management, Seeds, Spring, *Sprinkler irrigation, Irrigation practices, Longevity, Soil chemical properties, Soil physical properties, Root development, Root distribution, Plant growth, Saline soils, Sodic soils. Identifiers: *Humboldt River Basin (Nev), Greasewood (Sarcobatus vermiculatus), Wild rye grass, Sodic soils.

In the Humboldt River Basin of northern Nevada the replacement of some 394,000 acres of greasewood and rubber rabbitbrush with forage plants of high economic value would salvage a large portion of the 103,000 acre feet of water estimated to be used yearly by those non-beneficial phreatophytes. In this study tall wheatgrass and Great Basin wildrye were springseeded on the range site and established by sprinkler irrigation. An evaluation of the longevity and productivity of these seeded species under different irrigation regimes was made and showed that weekly irrigation. regimes was made and showed that weekly irriga-tions for 2-3 years were required to establish potentially productive stands of the seeded spe-cies. The highest production of tall wheatgrass and Great Basin wildrye was obtained 3 years after seeding with weekly irrigations of 1.25 inches of water, the wheatgrass being the more productive. Productivity with limited water or without water was reduced by the chemical properties of the was reduced by the chemical properties of the saline-sodic soil, while root growth was restricted by the physical characteristics of the soil. (Gloyd-Arizona) W73-13314

3C. Use of Water of Impaired Quality

SALINITY AND DRAINAGE IN A BROWN CHERNOZEM IRRIGATED AT DIFFERENT MINIMUM MOISTURE CONTENTS, Department of Agriculture, Lethbridge (Alberta).

Research Station.
K. K. Krogman, and E. H. Hobbs.
Can J Soil Sci. Vol 52, No 3, p 359-364, 1972. Illus. Identifiers: *Brown chemozem, Crop yields, *Drainage, Evapo-transpiration, Irrigation, Moisture, *Salinity, Transpiration.

The salinity of a brown chernozem under 4 irriga-tion regimes was measured at the beginning and end of each of 2 cycles of a 4-yr crop rotation. Ir-rigation reduced soil salinity during the first cycle and maintained it at the reduced level during the second cycle. Drainage in 4 yr, calculated on the basis of salt balances, increased proportionately to irrigation plus rainfall. Where only enough water was applied to maximize crop yields, that is, where soil moisture was maintained within the upper half of the available range, about 95% of the irrigation plus rainfall was utilized by the crops through evapotranspiration. Under this regime, maximum crop yields and an adequately low level of soil salinity were maintained.—Copyright 1973, Biological Abstracts, Inc. second cycle. Drainage in 4 yr, calculated on the

STUDIES ON SODIUM WATER FOR IRRIGA-TION, EFFECT OF ADDITION OF CATIONS:

TION. EFFECT OF ABULIANA
K, CA OR MG,
Punjab Agricultural Univ., Ludhiana (Indin). Dept.
of Soils.
B. K. Sinha, and G. Dev.
J Res Punjab Agric Univ. Vol 9, No 1, p 40-49.

Identifiers: *Berseem, Calcium, Cations, Growth, Irrigation, Magnesium, Potassium, water, Crop yield.

A greenhouse experiment was conducted on a loamy-sand soil to study the effect of irrigation water, containing 2 concentrations of Na, on berseem, as influenced by the presence of K, Ca or Mg. The use of Na water (12.8 me/l Na) drastically reduced the yield of berseem by affecting plant survival and growth, and resulted in an increased concentration of Na in the plants; the K content in plants decreased and the quality of the produce in terms of N content also deteriorated. The addition of K or Ca tended to offset the damaging effects of Na, both for the yield and the content of N in berconcentration of Na in water (12.8 me/l).—Copyright 1973, Biological Abstracts, Inc. W73-13192

Field 03—WATER SUPPLY AUGMENTATION AND CONSERVATION

Group 3C-Use of Water of Impaired Quality

SALT PICKUP FROM AGRICULTURAL LANDS IN THE GRAND VALLEY OF COLORADO, Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 05B.

PHYSICAL PROBLEMS AND THEIR AMELIORATION IN SALTY SOILS, Department of Overseas Trade, Canberra (Australia). Trade Commissioner Service.

For primary bibliographic entry see Field 02G.

PEDOGENIC CALCITE ACCUMULATION IN ARID AND SEMIARID REGIONS OF THE INDO-GANGETIC ALLUVIAL PLAIN OF ERSTWHILE PUNJAB (INDIA)—THEIR MORPHOLOGY AND ORIGIN, Ghent Rijksuniversiteit (Belgium). Geologisch In-

For primary bibliographic entry see Field 02G. W73-13311

EFFECT OF WASTE WATER FROM THE ASTRAKHAN CELLULOSE-PASTEBOARD PLANT ON SOIL PROPERTIES,

PLANT ON SOIL PROPERTIES, For primary bibliographic entry see Field 05D. W73-13315

PLANT INDUCED SOIL SALINITY PATTERNS IN TWO SALTBUSH (ATRIPLEX SPP.) COM-MINITIES

MUNITIES, Commonwealth Scientific and Industrial Research Organization, Deniliquin (Australia). Rivernina

Journal of Range Management, Vol 26, No 2, p 121-125, March 1973. 3 fig, 5 tab, 9 ref.

Descriptors: *Saline soils, *Plant growth, *Salt tolerance, *Soil-water-plant relationships, On-site investigations, Soil surveys, Decomposing organic matter, Leaching, Precipitation (Atmospheric), Evaporation, Water utilization, Saltation, Semiarid climates.

Identifiers: *Saltbush.

Atriplex vesicaria and A. nummularia were examined on two soil types. Both saltbush species induced significantly higher salinity in the 0-15 cm soil horizon beneath the bush canopies compared to between the bushes. Salinity level on only surface layers (0-7.5 to 15 cm) fluctuated with season; the salinity was highest during and after summer when the evaporative demands were high, and lowest during winter after rains. The contribution of salinity from the water table was examined and discounted as a highly doubtful source. It is hypothesized that salt accumulation, depletion, and compensation are a net result of processes which accumulate salts at one position and those which deplete them from the other. These processes include plant litter fall and its decomposition; leaching of salts from plants with rain, along with leaching in the soil profile; evaporation of water from soil surface and deposition of salts at the soil surface; water movement to plant roots and convectional transport of salts, including salt transport by ionic diffusion. (Bahre-Arizona) W73-13316

IRRIGATION MANAGEMENT FOR CONTROL OF QUALITY OF IRRIGATION RETURN FLOW.

FLOW, Utah State Univ., Logan. Dept. of Agricultural and Irrigation Engineering. For primary bibliographic entry see Field 05G. W73-13469 3D. Conservation in Domestic and Municipal Use

INSTITUTIONAL REQUIREMENTS FOR OP-TIMAL WATER QUALITY MANAGEMENT IN ARID URBAN AREAS, Colorado State Univ., Fort Collins. Environmental

Resources Center. For primary bibliographic entry see Field 05G. W73-13002

EVALUATION OF DISCONTINUITIES IN RE-GIONAL POPULATION PROJECTIONS, Massachusetts Univ., Amherst. Dept. of Sociolo-

gy. For primary bibliographic entry see Field 06B. W73-13006

ATTITUDES, VALUES, AND PERCEPTIONS IN WATER RESOURCE DECISION-MAKING WITHIN A METROPOLITAN AREA, Massachusetts Univ., Boston. Dept. of Political Science.

For primary bibliographic entry see Field 06B. W73-13008

HYDRA: DYNAMIC MODEL FOR URBAN HYDROLOGIC SYSTEMS, Nebraska Univ., Lincoln. Dept. of Computer

For primary bibliographic entry see Field 04A.
W73-13012

REGIONAL WATER RESOURCE PLANNING FOR URBAN NEEDS: PART II (APPENDICES), North Carolina Univ., Chapel Hill. Dept. of City and Regional Planning. For primary bibliographic entry see Field 06A. W73-13015

METHODOLOGY FOR ASSESSMENT OF URBAN WATER PLANNING OBJECTIVES, Texas A and M Univ. College Station. Water Resources Inst. W. I. Meier and B. M. Thornton

W. L. Meier, and B. M. Thornton.
Technical Report No 51, June 1973, 158 p, 33 fig, 6

Descriptors: Planning, *City planning, *Decision making, *Alternative planning, *Texas, *Urbanization, Water management (Applied), Water demand, Water utilization, Water quality standards, Local governments. Identifiers: *San Antonio River (Tex), Objective setting procedure, *Planning procedures.

One of the most perplexing problems in the United States is concerned with providing the public services required in rapidly-expanding urban areas. This problem involves the development, use, and management of water resources. In order to allocate the available physical and economic resources, water resource planners have concentrated on developing planning techniques to meet these allocation problems. Significant gains have been made by the application of systems analysis and operations reasearch, but little attention has been directed in the past towards the development of procedures for the formulation of objectives in water resource planning. This research is concerned with the study of urban water planning objectives in the San Antonio, Texas area. Specific goals were set and researched. Then, the procedure was applied to a realistic problem encountered by the San Antonio, Texas metropolitan area. The study indicates how other such procedures can be generated, depending on the lanning environment and the problems at hand.

The major conclusions are: (1) urban water planning will continue to be a complicated, yet indispensible, process for urban water management; (2) the objective setting is an important phase of the planning process; (3) there is a need for a stated procedure on how to assess urban water planning objectives, and (4) the procedure can be applicable to any area concerned with water planning objectives by water resource planning agencies. (Runkles-Texas) W73-13017

A PROCEDURE FOR ASSESSING WATER RESOURCES FOR URBAN PLANNING, Geological Survey, Washington, D.C. For primary bibliographic entry see Field 06A. W73-13035

PUBLIC AND INDUSTRIAL WATER SUPPLIES IN NORTHERN MISSISSIPPI, Geological Survey, Jackson, Miss. For primary bibliographic entry see Field 06D. W73-13042

RELIABILITY: A NEW PARAMETER IN URBAN WATER QUALITY MANAGEMENT, Texas A and M Univ., College Station. Dept. of Industrial Engineering.
For primary bibliographic entry see Field 05D. W73-13156.

3E. Conservation in Industry

AQUATIC ORGANISMS AND HEAVY METALS IN MISSOURI'S NEW LEAD BELT, Missouri Univ., Rolla. For primary bibliographic entry see Field 05C. W73-13037

PUBLIC AND INDUSTRIAL WATER SUPPLIES IN NORTHERN MISSISSIPPI, Geological Survey, Jackson, Miss. For primary bibliographic entry see Field 06D. W73-13042

GEOTHERMAL ENERGY-RESOURCES, PRODUCTION, STIMULATION. Stanford Univ., Calif. Dept. of Civil Engineering. For primary bibliographic entry see Field 06D. W73-13214

INTRODUCTION: THE ENERGY OUTLOOK, Union Oil Co. of California. Los Angeles. For primary bibliographic entry see Field 06D. W73-13215

WORLDWIDE STATUS OF GEOTHERMAL RESOURCES DEVELOPMENT, California Div. of Mines and Geology, Sacramento. For primary bibliographic entry see Field 06D. W73-13216

ASSESSMENT OF U.S. GEOTHERMAL RESOURCES, California Univ., Riverside. Inst. of Geophysics and Planetary Physics.
For primary bibliographic entry see Field 06D. W73-13217

CHARACTERISTICS OF GEOTHERMAL RESOURCES, Geological Survey, Menlo Park, Calif. D. E. White.

In: Geothermal Energy-Resources, Production, Stimulation; Proceedings of Special Symposium of

WATER SUPPLY AUGMENTATION AND CONSERVATION—Field 03

Conservation in Industry—Group 3E

American Nuclear Society, June 19-20, 1972: Stanford University Press, Stanford, Calif, p 69-94, 1973. 4 fig, 1 tab, 50 ref.

Descriptors: "Geothermal studies, "Electric power, "Electric power demand, "Thermal power-plants, Electric power production, Hydrogeology, Water resources development, Energy, Steam tur-bines, Wells. Identifiers: "Geothermal power, "Power demand.

The major known geothermal systems of the world and the existing capacity of the major producing fields are summarized. Hydrothermal—convention systems, whether dominated by vapor or by hot water, are generally associated with tectonic plate boundaries and volcanic activity. In hydrothermalconvention systems most heat is transferred in circulating fluids rather than by conduction. Hot water systems are characterized by liquid water as the continuous, pressure-controlling fluid phase. A few geothermal systems, including the important Larderello fields of Italy and The Geysers of California produced to resure the detection of the continuous pressure and the continuous pressure controlling fluid produced to the continuous pressure produced to the continuous pressure produced to the continuous pressure produced to the continuous pressure produced to the continuous pressure produced to the continuous pressure produced to the continuous pressure produced to the continuous pressure produced to the continuous pressure produced to the continuous pressure produced to the continuous pressure pressu California, produce dry or superheated steam with no associated liquid. Liquid water and vapor nor-mally coexist in the reservoirs with vapor as the continuous, pressure-controlling phase. One or more of several potentially important breakthroughs in technology may greatly expand the development of dry and low-temperature geothermal systems. Heat-exchange technology would permit utilizing the heat from fluids down to 100 deg C or less. Multipurpose developments, in-cluding desalination and chemical recovery, would cluding desaination and chemical recovery, would yield significant sharing of total costs. Low cost mechanical, chemical, or nuclear fracturing of hot, dry rocks would increase permeability, thus per-mitting introduction of fluids and recovery of stored energy. (See also W73-13214) (Knapp-USGS) W73-13218

EXPLORATIONS FOR GEOTHERMAL

RESOURCES,
California Univ., Riverside. Dept. of Geological
Sciences; and California Univ., Riverside. Inst. of Geophysics and Planetary Physics. J. Combs, and L. J. P. Muffler.

In: Geothermal Energy-Resources, Production Stimulation; Proceedings of Special Symposium of American Nuclear Society, June 19-20, 1972: Stan-ford University Press, Stanford, Calif, p 95-128, 1973. 15 fig, 81 ref.

Descriptors: *Geothermal studies, *Electric power, *Electric power demand, *Thermal power-plants, *Exploration, Subsurface investigations, Electric power production, Hydrogeology, Water resources development, Energy, Steam turbines, Wells. Identifiers: *Geothermal power, *Power demand.

The methods available for the exploration, discovery, and delineation of economic reservoirs of geothermal energy are reviewed. The objectives of geothermal exploration ventures are to locate areas underlain by hot rock, to estimate the volume, temperature, and permeability at depth, to predict whether wells will produce dry steam or a mixture of water and steam, and to predict the chemical composition of the produced fluid. The following steps, or phases, each successively more sophisticated and/or expensive are suggested: literature search, airborne survey, geologic and hydrologic survey, geochemical survey, geophysical survey, and drilling. (See also W73-13214) (K-napp-USGS) W73-13219

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I.

STEAM PRODUCTION AT THE GEYSERS GEOTHERMAL FIELD, Union Oil Co. of California, Cloverdale. Big Geysers Station. C. F. Budd, Jr. In: Geothermal Energy-Resources, Production, Stimulation; Proceedings of Special Symposium of American Nuclear Society, June 19-20, 1972: Stan-ford University Press, Stanford, Calif, p 129-144, 1973. 7 fig, 5 ref.

Descriptors: "Geothermal studies, "Electric pawer, "Electric power demand, "Thermal power-plants, Electric power production, Hydrogeology, Water resources development, Energy, Steam tur-bines, Wells, "California. Identifiers: "Geothermal power, "Power demand, "Geysers geothermal field (Calif).

At the Geysers in northern Sonoma County, At the Geysers in northern Sonoma County, California, the dominant phase of water is gaseous steam, a condition existing in only a few major commercially producing fields in the world, including the Larderello field in Italy and the Matsukawa field in Japan. A constant rate of production cannot be sustained. Individual wells have declined in production, and additional wells have declined in production, and additional wells have been required to maintain the supply of steam to the generating units. This has been the experience at the Larderello field as well, where continued drilling is required to maintain a constant generating capacity of 365 Mw. Pressure depletion in the reservoir is a factor in the production decline, and field-wide static reservoir-pressure surveys have confirmed this suggestion. A typical wellhead and pipeline configuration with the blowdown tee, centrifugal separator, meter run, and dirt-leg is shown. The utility's powerplant liquid effluent constitutes about 25% of the total condensed constitutes about 2576 of the total condensed steam throughout, the remainder being evaporated in the cooling towers. This effluent contains most of the water-soluble constituents of the steam and cannot be discharged into surface waters which are drawn upon for domestic and agricultural use. It is therefore reinjected into the steam formation hrough injection wells. (See also W73-13214) (K-napp-USGS)
W73-13220

DESIGN AND OPERATION OF THE GEYSERS POWER PLANT, Pacific Gas and Electric Co., San Francisco, Calif.

For primary bibliographic entry see Field 08C. W73-13221

THE VAPOR-TURBINE CYCLE IS GEOTHERMAL POWER GENERATION, For primary bibliographic entry see Field 08C.

ENVIRONMENTAL IMPACT OF GEOTHER-MAL DEVELOPMEN Oregon State Dept. of Geology and Mineral Indus-

For primary bibliographic entry see Field 06G. W73-13224

RECOVERY OF GEOTHERMAL ENERGY FROM HOT, DRY ROCK WITH NUCLEAR EX-

Battelle-Northwest, Richland, Wash. Geothermal For primary bibliographic entry see Field 08H. W73-13226

EXPLOSIVE STIMULATION OF HYDROTHER-MAL RESERVOIRS, Stanford Univ., Calif. Dept. of Petroleum En-

gineering.
For primary bibliographic entry see Field 08H.
W73-13227

GEOTHERMAL RESOURCES RESEARCH, National Science Foundation, Washington, D.C. Div. of Advanced Technology Applications. For primary bibliographic entry see Field 06D. W73-13232 HEAT RECOVERY IN PROCESS PLANTS. Struthers Wells Corp., Warren, Pa.
For primary bibliographic entry see Field 05D.
W73-13431

GEOTHERMAL POWER STILL IFFY,

G. Weismantel. Chemical Engineering, Vol 80, No 6, p 40-41, March 5, 1973. 2 fig.

Descriptors: "Thermal power plants, "Geothermal studies, "Brines, "Steam, "Design, Efficiencies, Electric power production, Geology, Heat flow, Temperature, Brine disposal, Drilling, Trace elements, Costs, Environmental effects, Evaluation, Identifiers: *Mexico (Cerro Prieto), Magmamax

process.

Interest in the possibility of geothermal-based power units has grown in the face of the U.S.'s rising fuel and power shortage. During 1972, electricity has flowed from geothermal power units in Cerro Prieto, Mexico; the Magmamax process of Magma Power Company has found a sponsor; and a test facility for electricity and pure water production has been developed by Envirogenics Company. These three systems tap into earthlocked hot brine which is about 500 F, to flash off steam to run turbines. The cycle efficiency of the Cerro Prieto facility is about 10-15%, but is expected to grow to about 30% with more diversified use of the geothermal energy. Envirogenics believes 22-30% efficiency can be achieved with its dual purpose process. The corrosive properties of brine increase equipment costs and the presence of trace materials threatens the biological commaunity in recipient streams. Some problems may be by-passed with the development of a helical screw expander which is now being tested. The cost of electricity of the Cerro Prieto facility is \$350/kw not including brine disposal and air pollution connot including brine disposal and air pollution control. This may not be low enough to compete with nuclear or oil fire generators. (Jerome - Van-

PREOPERATIONAL CLEANING OF HIGH PRESSURE STEAM SYSTEMS, Black and Veatch, Kansas City, Mo. T. C. Hoppe, and J. G. Parmley. Industrial Water Engineering,

Engineering, 25-28. March/April 1973.

Descriptors: *Steam, *Industrial plants, *Opera-Descriptors: "Steam, 'Industrial plants, 'Opera-tion and maintenance, 'Cleaning, Thermal water, Electric power production, Facilities, Equipment, Maintenance, Installation, Maintenance costs, Re-liability, Specifications, Methodology, Testing procedures, Storage requirements, Abrasive blast-ing, Detergents. ing, Detergents. Identifiers: Pre-operation treatment.

Identifiers: Pre-operation treatment.

The preoperation cleaning of steam systems is necessary to insure efficient operation and maintenance of the system. During construction and tests steps should be taken to prevent corrosion or visible gross material inadvertently remaining in the system after erection. Cycle components should be shop-coated with corrosion inhibitors and in hydrostatic testing only treated demineralized water should be used. The three basic steps in preoperational cleaning consist of: (1) water flushing to physically remove dirt and siliceous materials; (2) hot alkaline detergent washing to remove oils and grease; (3) hot acid cleaning to solubilize that have not been pre-blasted. The major consequences of improper residual stilica from surfaces that have not been pre-blasted. The major control are discussed. These include oil build-up, tube failure due to improper flushing. It is suggested that pre-boiler systems be acid-cleaned following the hot detergent wash, and although the initial cost of alkaline detergent cleaning is high it is economical in the long run. (Jerome-Vanderbilt) W73-13444

Field 03-WATER SUPPLY AUGMENTATION AND CONSERVATION

Group 3E—Conservation in Industry

TEMPERATURE PROFILES IN CONDENSERS, Oklahoma State Univ., Stillwater.

K. J. Bell. Chemical Engineering Progress, Vol 68, No 7, p. 81-82, July 1972. I fig.

Descriptors: "Condensers, "Steam, "Tempera-ture, "Cooling, Water quality control, Water cool-ing, Equipment, Heat exchangers, Condensation, Boilers, Mathematical models, Model studies, **Profiles**

Some configurations of process condensers with integral desuperheating and/or subcooling are examined and analyzed. To determine whether or not condensation will occur on a cold surface exposed to superheated vapor it should be assumed that to supernease vapor it should be assumed that heat is transferred from the superheated vapor by sensible heat transfer. An equation for this situa-tion is presented in which it is seen that if the tem-perature on the vapor side is greater than the con-densing or saturation temperature, condensation will occur. The limited available information indicates that the heat transfer coefficient for condensation directly from superheated vapor is within a few percent of that for condensation from saturated vapor. It is simpler to assume that con-densation will occur directly from the superheated densation will occur directly from the supermeated vapor, using the saturation temperature and a condensing heat transfer coefficient in the rate equation, and including the sensible heat in the heat load. Where moderate subcooling is required, it may be desirable to provide a region in the shell where condensate may exchange heat with the coolant entering. (Jerome-Vanderbilt) W73-13445

HEAT-TRANSFER AGENTS FOR HIGH-TE-MPERATURE SYSTEMS,

General Electric Corporate Research and Development, Schenectady, N.Y. For primary bibliographic entry see Field 08C. W73-13446

TREATMENT OF RADIOACTIVE STEAM-GENERATOR BLOWDOWN,
NUS Corp., Pittsburgh, Pa. Cyrus Wm. Rice Div.
For primary bibliographic entry see Field 05D.
W73-13447

WATER TREATMENT FOR HEATING AND PROCESS STEAM BOILERS, For primary bibliographic entry see Field 05F.

EFFECT OF NONCONDENSABLES IN SEA WATER EVAPORATORS, Burns and Roe Construction Corp., Chula Vista,

R. A. Khan

Chemical Engineering Progress, Vol 68, No 7, p 79-80, July 1972. 1 fig.

Descriptors: *Condensers, *Sea water, *Evaporators, *Heat transfer, Evaporation control, Design, Model studies, Water cooling, Experimental models, Mathematical models, Evaluation, Trans-Identifiers: *Noncondensables

The presence of noncondensables in vapor con-densers reduces heat transfer and causes gas binding. To remove non-condensables, a vent stream is withdrawn at the last tube row in the bundle. A vertical tube evaporator was built to obtain the minimum amount of vent stream. Results indicate that the vent rate is important in maintaining the bundle heat transfer coefficient at low noncon-densable levels. The minimum vent rate is much higher than the amount of noncondensable present because a minimum vapor velocity is necessary for effective sweeping of the noncondensable through the tube bundle. Tests at high noncon-densable loading indicate the vent rate is important in maintaining bundle heat transfer coefficients. Tests do not indicate any gross noncondensable stratification in the vertical shell. An empirical model for the loss of heat transfer coefficient due to noncondensable film resistance can be used as a rough guide for predicting the local bundle coefficients. (Jerome - Vanderbilt) W73-13463

NOMOGRAMS SIMPLIFY DESIGN OF STEAM

CONDENSERS,
For primary bibliographic entry see Field 08C.
W73-13464

REQUISITES FOR NON-POLLUTING MICRO-BICIDES, ry bibliographic entry see Field 05D.

UPPER MISSISSIPPI RIVER COMPREHENSIVE BASIN STUDY, APPENDIX M-POWER. Federal Power Commission, Chicago, Ill. For primary bibliographic entry see Field 06B. W73-13493

WATER REQUIREMENTS OF THE PETROLE-UM REFINING INDUSTRY, Maryland Univ., College Park.

Maryana L. E. Otts, Jr. Geological Survey Water Supply Paper 1330-G, p

Descriptors: "Water supply, Cooling, "Industrial water, Surveys, "Water requirements, Chemical reactions, Polymers, Planning.

Identifiers: "Petroleum industry, Cracking (Petroleum), Refineries, *Recirculat

About 3,500 million gallons of water was withdrawn daily in 1955 for use by petroleum refineries in the United States. This was about 3 percent of the estimated daily withdrawal of industrial water in the United States in 1955. Ninety-one percent of the water requirements of the petrole-um refineries surveyed was for cooling. One-third of the refineries reused their cooling water from 10 to more than 50 times. Only 17 refineries used once-through cooling systems. Refineries with recirculating cooling systems, terculated about twice as much cooling water but needed about 25 times less makeup; however, they consumed about 24 times more water per barrel of charge than refineries using once-through cooling systems. The average noncracking refinery used about 375 gallons of water per barrel of crude, which is less than the 41-gallon average of refine-ries with cracking facilities. Refinery-owned sources of water supplied 95 percent of the makeup-water requirements. Surface-water sources provided 86 percent of the makeup-water demand. Less than 1 percent of the makeup-water was obtained from reprocessed municipal sewage. percent of the water requirements of the petrolewas obtained from reprocessed municipal sewage. (Campbell-NWWA) W73-13561

3F. Conservation in Agriculture

HIGH-LIFT PUMPING AND THE IMPACT UPON ECONOMIC DEVELOPMENT OF DESERT LAND IN IDAHO,

Idaho Univ., Moscow. Dept. of Agriculture.

Idano Univ., Moscow. Bopt. of Agriculture.
K. H. Lindeborg.
Idaho University Water Resources Research Institute Research Project Technical Completion Report, December 1970. 8 p, 1 fig, 1 tab, 3 ref.
OWRR-A-002-IDA (1).

Descriptors: Water resources development, *Land development, *Irrigation, *Deserts, *Idaho, Imported water, Agriculture, Costs, Economics, Model studies, Evaluation. Identifiers: *Nampa (Idaho).

This study was conducted in the Dry Lake area at Nampa, Idaho, where companies are pumping irrigation water from the Snake River to a plateau 500 to 600 feet above the river surface. Data was 500 to 600 feet above the river surface. Data was secured for 8 farms by interviewing each farm operator and land owner. To make comparisons between farms and also between enterprises, the data were broken down into per acre variable costs, fixed costs, total returns, net income, and costs, fixed costs, total returns, net income, and the cost of producing a dollar's worth of output. The budgeting method of estimating water values in irrigation was used. Long-run planning cost curves were estimated from the budgets by using curvilinear regression. From the regression equations for each of the four enterprises (grain, sugar beets, potatoes, and alfalfa seed), 12 model farms were constructed. The long-run average total cost curve for the model farms, which incorporates a long-run rotation and long-run price and yield expectations, indicated economies of farm size of up to 2,400 acres. Net income, the measurement of how much money is left over to pay for irrigation to 2,400 acres. Net income, the measurement of how much money is left over to pay for irrigation water after all expenses (including remuneration for management, land, and investment) have been paid, varied from about \$50.00 to \$57.00 per acre for all model farms. (Woodard-USGS) W73-13027

WATER AND LAND RESOURCES IN EDEN VALLEY, WYOMING, Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.

Agricultural Engineering. T. L. Hall, and J. H. Taylor. Completion Report, February 1973. 180 p, 26 fig, 83 tab, 16 ref, 3 append. OWRR B-043-COLO (10).

Descriptors: "Water resources, "Land resources, "Land use, "Hydrologic budget, "Wyoming, Irrigation, Crops, Phreatophytes, Evapotranspiration, Water balance, Water quality, Water management (Applied), Consumptive use, Groundwater, Hydrogeology, Aquifer characteristics. Surface. teristics, Surface waters. Identifiers: *Eden Valley (Wyo).

An inventory of existing information on land and water resources was made for Eden Valley, Wyoming. Much of the data came from existing reports of the United States Bureau of Reclamation. Some data were obtained from the University of Some data were obtained from the University of Wyoming on irrigation efficiency studies concurred with the crops and phreatophytes in the valley in order that the consumptive use requirement could be computed. Being able to compute evapotranspiration allowed water budgets to be prepared for the 1963-1999 water years. A summary of mean monthly and mean annual water budget is reported. (Woodard-USGS)

THE EFFECT OF WATER AND SALT FLUXES ON THE TRANSPOOT POTENTIAL IN

HELIANTHUS ANNUUS, Atomic Energy Agricultural Research Center, Tando Jam (Pakistan). For primary bibliographic entry see Field 02I. W73-13066

STUDIES ON THE SOIL-WATER SYSTEM IN JAPANESE), Utsunomiya Univ., Tochigi (Japan). Coll. of Agriculture.

W73-13091

RICE SEEDLINGS GERMINATED IN WATER WITH NORMAL AND IMPEDED ENVIRON-MENTAL GAS EXCHANGE, Birmingham Univ. (England). Dept. of Botany. H. A. Kordan. J Appl Ecol. Vol 9, No 2, p 527-533, 1972. Illus.

WATER SUPPLY AUGMENTATION AND CONSERVATION—Field 03

Conservation in Agriculture—Group 3F

Identifiers: Environmental studies, Gas exchange, *Rice seedlings, Weter-atmosphere interfaces, *Germination (Rice).

Marked differences in growth and developmental phenomena became evident in rice seedlings ger-minated in water when the normal gas exchange between the water and the atmosphere above was impeded. Normal growth and development of the seedlings were suspended during prolonged exposeedings were suspensed ouring prolonged expo-sure of the plants to the aqueous medium where the normal environmental gas exchange was hin-dered. Provided that the seedlings were not severely damaged by microbial activity, normal growth and development of the plants were resumed when the normal gas exchange between the aquatic environment and the atmosphere above was restored.--Copyright 1973, Biological Abstracts, Inc. W73-13092

COMPETITION BETWEEN GRASS AND CLOVER FOR PHOSPHATE: II. EFFECT OF

ROOT ACTIVITY, EFFICIENCY OF RESPONSE TO PHOSPHATE, AND SOIL MOISTURE, Department of Scientific and Industrial Research, Palmerston North (New Zealand). Grassland Div. R. H. Jackman, and M. C. H. Mouat. N. Z. J. Agric Res. Vol 15, No 4, p 667-675, 1972. Il-

Identifiers: Agrostis-Tenuis, *Clover, *Grass, *Phosphates, *Root systems, Soil moisture, Trifolium-Repens.

Factors studied were the relative root activities for Puptake by white clover (Trifolium repens L.) and browntop (Agrostis tenuis Sibth) at different depths in the soil, the root tip numbers per unit volume of soil, the loss of soil moisture caused by the presence of browntop, and the response curves of white clover and browntop to applied P. Grass and clover roots can directly compete for P in the top 2.5 cm of top dressed soil, the grass can decrease the availability of P by increasing soil moisture tension, and both these results will affect white clover more adversely than browntop, because of the markedly less efficient response to applied P of clover than of browntop. This result will be most strongly expressed in soils which strongly fix P and easily develop high moisture tension.—Copyright 1973, Biological Abstracts, W73-13097

INFLUENCE OF SURFACE SOIL CONDITIONS ON DRYING IN EARLY SPRING, Macdonald Coll., Montreal (Quebec). Dept. of Soil

M. M. Iqbal, and B. P. Warkentin.

Can J Soil Sci. Vol 52, No 3, p 449-456, 1972. Identifiers: Bulk, Density, *Drying, *Hydraulic conductivity, *Soils (Plowed and unplowed),

Changes in water content of adjacent plowed and unplowed surface soils were measured in early spring in the field. The plowed plots on sand and clay soils lost more water than unplowed plots. The major decrease in water content of the clay soil was in the 0-7-cm layer, whereas the sand lost as much water from the 7-15-cm layer as from the 0-7-cm layer. The medium-grained soil showed greater drying from the unplowed than from the plowed surface. The higher bulk density of this soil may account for this observation. Differences in net radiation measured above plowed and unplowed surfaces were too small to account for the measured differences in water loss. There was measured differences in water loss. There was evidence that the drier surface was due to lower hydraulic conductivity of the plowed surface, but increased turbulent transfer from the rougher surface could also be involved.—Copyright 1973, Biological Abstracts, Inc. W73-13098

LOSSES OF ATRAZINE IN RUNOFF WATER AND SOIL SEDIMENT, Pennsylvania State Univ., University Park. Dept. of Soil Chemistry. For primary bibliographic entry see Field 05B. W73-13102

PESTICIDES, POLLUTION, AND FOOD

SUPPLY, Cornell Univ., Ithaca, N.Y. Dept. of Entomolo For primary bibliographic entry see Field 0SG. W73-13104

EFFECT OF WATER REGIME ON THE SUCROSE-ENZYME RELATIONSHIPS OF SU-GARCANE DESSICATED WITH PARAQUAT, Puerto Rico Univ., Mayaguez. Agricultural Experiment Station.

R. Montalvo-Zapata, and A. G. Alexander.
J Agric Univ P R. Vol 56, No 2, p 134-153. Illus. 1972.

Identifiers: Enzymes, Herbicides, *Paraquat, *Sucrose-enzyme relations, *Sugarcane, Water

Immature sugarcane was given variable-water regimes in sand culture and subsequently treated with a powerful desiccant, the bipyridylium herbiwith a powerful desiceant, the bipyridylum herbi-cide Paraquat, applied as a 0.05 percent aqueous foliar spray. The objectives were to evaluate the effects of water regime on sucrose-enzyme rela-tionships in desiceating sugarcane, and to deter-mine whether controlled water regimes could ef-fectively with the controlled water regimes could efmine whether controlled water regimes could effectively modify Paraquat activity in sugarcane. Tissue samples were harvested for moisture, sugar and enzyme analyses at 1, 3 and 9 days after Paraquat application. Low water supply (1 liter/day) reduced total fresh weights and stalk weights, and increased sucrose content of immaweights, and increased sucrose content of immature storage tissue. Paraquat significantly lowered total fresh weights, stalk weights, sheath moisture and leaf sucrose by the 9-day harvest. Desiceant action was generally more rapid within the low-water regime. High- and intermediate-water regimes tended to modify Paraquat activity at 1 or 3 days, but its ultimate effects were comparable regardless of water regime. No evidence was found to support the theory that desiscating cane accumulates water as a function of continued water absorption when transpiration has ceased. Acid invertase was suppressed by Paraquat. The suppression was most severe in the low-water regime. Low-water supply significantly lowered suppression was most severe in the low-water regime. Low-water supply significantly lowered invertase level but the response was not consistent at all harvests. Acid phosphatase and ATPase were severely repressed by Paraquat in leaves but not in immature storage tissue. An explanation was offered in terms of distinct chloroplast and mitochondrial enzymes rather than localized Paraquat action. For both enzymes the desiccant repression was significantly more severe in the high-water regime at 1 or 3 days, but water regime showed no effect at 9 days. Paraquat significantly increased beta-amylase in leaves particularly within the high-water regime. In immature stem tissue beta-amylase was repressed by high water in within the high-water regime. In immature stem tissue beta-amylase was repressed by high water in Paraquat-free plants. Paraquat eliminated the water effect. Peroxidase was increased in storage tissue by Paraquat. This response was statistically significant only under conditions of low-water supply. Variable water regimes can modify the rate of initial Paraquat activity in sugarcane; how-ever, the ultimate effects of Paraquat will not be changed under conditions of thorough chemical application. Under field conditions of marginal chemical penetration, the plant's moisture status might play a more decisive role in determining the might play a more decisive role in determining the desiccant's effectiveness.—Copyright 1973, Biological Abstracts, Inc. W73-13114

PHOSPHATE MOVEMENT FROM AN AGRICULTURAL WATERSHED DURING TWO RAINFALL PERIODS, Agricultural Research Service, Beltsville, Md. Soil

and Water Conservation Research Div.

For primary bibliographic entry see Field 05B. W73-13115

WATER LOSS FROM CUT GRASS WITH SPE-CIAL REFERENCE TO HAY-MAKING, Volcani Inst. of Agricultural Research, Bet-Dagan (Israel)

Y. Leshem, R. Thaine, C. E. Harris, and R. J.

Canaway.

Ann Appl Biol. Vol 72, No 1, p 89-104. 1972. Illus. Identifiers: Air, Drying, "Grass, "Hay, Humidity, Petroleum vapor, Temperature, Tissue, Treatments, Vapor pressure, "Water loss.

An apparatus, used to measure water loss at 28 plus or minus 1C from blotting paper and from leaves and stem internodes of cocksfoot, consisted of 4 channels in which air speed was controlled at 25-80 cm/s and relative humidity at 7-68%. The maximum rate of water loss from wet blotting paper was 10,500 mg water/dm/hr but from leaves and stem internodes supplied with water it was less than 250 mg/dm/hr. The rate of loss from both plant specimens and blotting paper was linearly related to the vapor pressure differences between the specimen and the surrounding air but was not increased when air speed was changed from 40 to 80 cm/s. Grass specimens supplied with water had lower rates of water loss than wet blotting paper because of tissue resistances which were calculated for (a) untreated leaf and stem specimens, (b) rubbed leaves, (c) cut leaves, (d) leaves exposed to steam for 60 s. Treatments (b) - (d) greatly reduced tissue resistances. The (d) leaves exposed to steam for 60 s. Treatments (b)- (d) greatly reduced tissue resistances. The rates of drying of leaves and stem internodes not supplied with water changed only slightly in response to faster air speeds but were significantly increased by treatments (b), (c), (c sub) (split stems), (d) and (e) (exposure to petroleum vapor for 60 S). The most effective treatments trebled the drying rates of stem internodes by 10 times. Reductions in relative humidity had little effect on drying rate following treatments (c sub) and (3) were given, additional significant increases in drying rates were obtained when the relative humidity was reduced. Grass specimens given the most effective treatments and dried under the most favorable conditions did not dried under the most favorable conditions did not specimens given the most effective treatments and dried under the most favorable conditions did not utilize the full drying capacity of the environment, for the rates of water loss from these specimens were at least 3 times lower than those from wet blotting paper. High rates of drying could aparently be achieved at 28C or similar temperatures if practical treatments were developed to water loss in cut grass.—Copyright 1973, Biological Abstracts. Inc. Abstracts, Inc. W73-13119

ECONOMIC SIGNIFICANCE OF DRY-LAND FARMING IN THE ARID NORTHERN NEGEV

Israel Meteorological Service, Bet-Dagan. Div. of Agricultural Meteorology.

Agric. Meteorol. Vol 10, No 4/5, p 383-392. 1972.

Identifiers: Arid lands, *Dry-land farming, Economic farming, Irrigation, "Israel (Ne Desert), Rainfall, Wheat yield relationshi Statistical studies, "Wheat yield. *Israel (Negev

Under arid conditions rainfall-wheat yield rela Onder and conditions rainal-wheat yield reas-tionships analyzed by means of simple and multi-ple regressions principal components and Fisher's orthogonal polynomial method all gave good results. Fisher's technique was then employed to estimate the effect on final yield of a unit change estimate the effect on final yield of a unit cnange in rainfall. The response curve obtained was used to calculate wheat yields for a cross-section of the northern Negree, where mean annual rainfall varies from 200-41 mm. A 20% profit margin can probably be obtained in 7 of every 10 yr only in an area where the mean annual rainfall is at least 300mm. Where rainfall is below 300 mm additional

Field 03—WATER SUPPLY AUGMENTATION AND CONSERVATION

Group 3F-Conservation in Agriculture

irrigation is essential, for in an area of 240 mm 20% arrigation is essential, for in an area of 240 mm 20% profit margins can only be obtained 3-4 times in every 10 yr. Under local climatic and soil conditions and agrotechnical practices the highest average yield response to irrigation is obtained during the first 40 days after planting.—Copyright 1973, Biological Abstracts, Inc.

INHERITANCE AND PHYSIOLOGICAL EFFECTS OF STOMATAL FREQUENCY IN BAR-LEY, Funk Bros. Seed Co., Bloomington, Ill. Winter

Wheat Research.

K. E. Miskin, D. C. Rasmusson, and D. N. Moss. Crop Sci. Vol 12, No 6, p 780-783. 1972. Illus. Identifiers: *Barley, Droughts, Hordeum-Vulgare, Inheritance, *Photosynthesis, Physiological effects, *Stomatal frequency, *Transpiration.

The inheritance of stomatal frequency in 5 barley (Hordeum valgare L.), populations and the effect of stomatal frequency on photosynthesis, transpiration, and stomatal resistance to diffusion were studied. Barley lines high and low in stomatal frequency from 2 backcross populations were used. Heritabilities, estimated by the parentprogeny regression method, ranged from 22 to 74%. These estimates were for the F2 and F3 generations on the individual plant basis. Realized heritabilities based on simulated high and low selection were in good agreement with the regression estimates, although the estimates were consistently higher for the high than for the low selection. For plants pretreated to assure open stomata, stomatal diffusive resistances and transpiration rates different estatically expense lines have stomata unitable reasonances and transpiration rates differed statistically among lines, but photosynthesis did not. Lines having low stomatal frequencies had higher stomatal resistances, and transpired less water than lines with more stomata. A 25% decrease in frequency of stomata reduced transpiration rates by about 24%. Stomatal frequency did not influence the rate of otosynthesis, however. The possibility exists of altering transpiration without altering photosynthesis by selecting varieties with fewer stomata.—Copyright 1973, Biological Abstracts, W73-13125

CLIMATIC UNCERTAINTY EFFECTS ON MANAGEMENT AND DESIGN OF RESERVOIR-IRRIGATION SYSTEMS, Montana State Univ., Bozeman. Dept. of Economics and Agricultural Economics.

N. J. Dudley.

In: Proceedings (Vol. II), International Symposium on Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tucson, December 11-14, 1972. p 508-517, (1972). 1

Descriptors: *Reservoirs, *Irrigation projects, *Design, *Management, *Simulation analysis, *Dynamic programming, *Model studies, Optimization crops, Reliability, Water supply, Systems analysis, *Risks.

Before determining optimal levels of design variables for proposed water resource systems, one must optimize operational management for dif-ferent design-variable combinations. In irrigation systems especially, such optimization is com-plicated by climatic uncertainty. Traditional pro-ject evaluation procedures use deterministic crop water requirements and the objective of a hig water requirements and the objective or a night level of reliability of water supply to farmers. Each of these may lead to sub-optimal designs in climatically-variable environments. Models developed to incorporate variable crop water use and obtain measures of expected net revenue-net revenue variance tradeoffs to aid in selecting op-timal reliability levels are briefly reviewed. In the proposed project examined, both the expected

value and variance of net revenue are very sensitive to changes in the reliability level. (See also W73-13134) (Bell-Cornell)

ESTIMATING BENEFITS TO IMPROVED SEASONAL WATER SUPPLY FORECASTS: A CASE STUDY OF IRRIGATION BENEFITS, Battelle Memorial Inst., Columbus, Ohio.

J. L. BROOFE.

In: Proceedings (Vol. II), International Symposium on Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tucson, December 11-14, 1972. p 610-628, (1972). 1 fig, 5 tab, 14 ref.

Descriptors: "Estimating, "Benefits, "Seasonal, "Water supply, "Forecasting, "Irrigation, "Linear programming, "Streamflow, Crops, Probability, Harvesting, Optimization, Acreage, Mathematical models, Systems analysis. Identifiers: Error, Bayes' formula

The approximate benefits to a typical irrigation The approximate benefits to a typical irrigation area from improved seasonal streamflow forecasts are quantified using a probabilistic linear programming model. In this formulation, a two-period analysis is represented in which planting crops takes place on the basis of probabilistic predictions of the water supply necessary for growing and harvesting crops. The decision variable of interest is the change in acreages planted that may take place as the dispersion of forecast error is reduced. Seasonal streamflow forecasts give rise in theory to conditional probability distributions of observing various quantities of seasonal water observing various quantities of seasonal water supply. Hypothetical conditional probabilities are computed using Bayes' formula. Increase in accuracy is measured by using calculations of the conditional entropy of the probability distributions derived from the Bayes formulation. The model derived from the payes tormunation. The modes serves to allocate a region's crop acreages so as to maximize the expected income of planting associated with each forecast. Output includes expected income for each forecast and crop acreages planted based on each forecast. Results from testing the model indicate gross benefits repaine from ing the model indicate gross benefits ranging from a few cents per acre up to as much as \$6.00 per acre. The results exhibit diminishing returns to successive increments of increased forecast accuracy. (See also W73-13141) (Bell-Cornell) W73-13143

DRY FARMING: UNCERTAINTY IN LAND AND WATER PRODUCTIVITY,

Arizona Univ., Tucson.
O. Benassini, J. F. Bueno, and H. K. Qashu.
In: Proceedings (Vol. II), International Symposium on Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tucson, December 11-14, 1972, p 884-902, (1972). 6 fig., 1 tab.

Descriptors: *Dry farming, *Land, *Productivity, Agriculture, Crops, Precipitation (Atmospheric), Probability, Resources development, Manage-ment, Technology, Irrigation, *Risks. Identifiers: Gains, Penalties, Space-time distribu-

Productivity of land, water and human resources is a function of different interactive processes of varying complexity. Resource development and management planning implies knowledge of the system behavior and its production capacity. Three sets of production levels are recognized: (1) Current production levels under present practices Current production levels under present practices; (2) potential production capacity through optimal use of present technology and small investments; and (3) potential production capacity through larger investments and development of water resources. A comprehensive system for comparing gains and penalties generated from additional and/or improved practices to increase productivity is presented. The proposed system recognized space-time distribution of rainfall, soil-crop alloca-tion, crop ecology, and supplemental irrigation de-mands. (See also W73-13134) (Bell-Cornell) W73-13160

GAS CHROMATOGRAPHIC DETERMINATION OF RESIDUES OF METHYLCARBAMATE IN-SECTICIDES IN CROPS AS THEIR 2,4-DINITROPHENYL ETHER DERIVATIVES, Agricultural Research Service, Beltsville, Md. For primary bibliographic entry see Field 05A. W73-13282

POTENTIAL EVAPORATION FROM PASTURE AND POTATOES AT ASPENDALE, Commonwealth Scientific and Industrial Research

Organization, Aspendale (Australia). Div. of Atmospheric Physics.
For primary bibliographic entry see Field 02D.
W73-13296

SOCIOLOGICAL CONSIDERATIONS IN IR-RIGATION WATER MANAGEMENT: FACING PROBLEMS OF WATER QUALITY CONTROL, Colorado State Univ., Fort Collins. For primary bibliographic entry see Field 05G. W73-13307

A COMPARATIVE STUDY OF SOIL VERSUS FOLLAR APPLICATION OF AMMONIUM NITRATE TO WHEAT UNDER DIFFERENT MOISTURE REGIMES,
Newe Yaar Experiment Station (Israel). Div. of

Forage Crops and Pasture. H. Nerson, and Z. Karchi. Israel Journal of Agricultural Research, Vol 22, No 3, p 171-177, September 1972. 1 fig, 3 tab, 8 ref.

Descriptors: *Nutrient requirements, *Ammor Descriptors: "Nutrient requirements, "Ammoni-um compounds, "Moisture availability, "Soil moisture, Wheat, Growth rates, Foliar applica-tion, Soil treatment, Water utilization, Semiarid climates, Cultivation, Nitrogen.

The effect of foliar and soil top-dressing of liquid ammonium nitrate, applied 5-7 days prior to heading of main culms, was studied under three different water regimes in a pot experiment. The effect of nitrogen treatments on dry matter accumu-lation was closely associated with the moisture level. The highest rate of growth was achieved by nitrogen treatment to pots kept at field capacity and the lowest rate by the same treatments kept at 30 percent available moisture. Foliar treatments induced an immediate effect on rate of growth, especially at the lowest moisture level, whereas, soil treatment tended to have a lasting effect on rate of growth, especially at the highest moisture level. Plant yield was significantly correlated with the number of tillers, spikes, and grains per plant. Soil application of nitrogen was more efficient than foliar application in increasing all of these parameters. Under semiarid conditions where moisture is limited, it might be desirable to seed populations having plant areas conducive to tiller-ing, whereas under conditions where high plant density is practiced, and a good moisture supply is guaranteed, tillering would be undesirable. Application of foliar top dressing of ammonium nitrate would be more effective. (Bahre-Arizona) W73-13313

SALT AND MEAL-SALT HELP DISTRIBUTE CATTLE USE ON SEMIDESERT RANGE, Forest Service (USDA), Tucson, Ariz. Rocky Mountain Forest and Range Experiment Station. S. C. Martin, and D. E. Ward. Journal of Range Management, Vol 26, No 2, p 94-97, March 1973. 3 fig. 1 tab, 9 ref.

WATER SUPPLY AUGMENTATION AND CONSERVATION—Field 03

Conservation in Agriculture—Group 3F

Descriptors: *Arizona, *Salt tolerance, *Livestock, *Grazing, *Water requirements, Toxicity, Range management, Water demand, Forage grasses, Semiarid climates. grasses, Semiarid climates. Identifiers: *Santa Rita Experimental Range

A study was conducted on the Santa Rita Experimental Range (near Tucson, Arizona), to determine whether salt or meal-salt mixtures were effective in improving distribution of grazing use, and whether livestock were affected detrimentally that sale in the sale was all with a territory. by placing either salt or meal-salt at remote locans on semidesert range. It was observed that tions on semidesert range. It was observed that placing salt away from water does not hurt cattle either by depriving them of adequate salt or by making them thirsty. Cows ate less than 1/2 lb/day of 3:1 meal-salt mix when it was fed 1 to 2 1/2 miles from water. No injury to cattle due to either inadequate or excessive salt was determined; however, low intake of supplement where mixtures contain as much as 25% salt may be a problem if fed far from water. The grazing distribution problem will not be solved by placement of salt or meal-salt alone, but in many cases, use on heavily grazed areas near water can reduce grazing grazed areas near water can reduce grazing grazed areas near water can reduce grazing damage only by appropriate periods of deferment or rest. (Bahre-Arizona) W73-13317

NOTE ON THE INFILTRATION ADVANCE FRONT FROM BORDER IRRIGATION, Connecticut Agricultural Experiment Station, New Haven. For primary bibliographic entry see Field 02G. W73-13371

ON THE INFLUENCE OF SODIUM ON THE WATER STATUS OF SUGAR BEET, Akademiya Nauk SSSR, Ufa. Bashirskii Filial.

L. I. Sergeev, and F. S. Japparov. Beit Trop Subtrop Landwirtsch Tropenveterinaer Med. Vol 8, No 4, p 303-308. 1970. Illus. English

summary. Identifiers: Fertilization, *Nitrates, *Sodium chloride, *Sugar beets, Sylvinite, Water status.

Effect of NaNO3, NaCl and sylvinite on the water-keeping capacity of leaves was studied, using the Arland wilting method. The water-keeping capacity was increased most (at an average of 14%) by adding NaCl. The sugar yield of soils poor in Na could be increased by 20-30% by means of Na the Arlands of Naclean (Capacitat 1973). Na salt fertilization.-Copyright 1973, Biological Abstracts, Inc. W73-13393

DIFFERENTIAL STOMATAL RESPONSE BETWEEN C3 AND C4 SPECIES TO AT-MOSPHERIC CO2 CONCENTRATION AND

MOSPIERIC CO2 CONCENTRATION A. LIGHT, National Inst. of Agricultural Sciences, Kon (Japan). Dept. of Plant Physiology and Genetics For primary bibliographic entry see Field 02D. W73-13398

Commissariat a l'Energie Atomique, Fontenay-aux-Roses (France). Centre d'Etudes Nucleaires. For primary bibliographic entry see Field 05B. W73-13416

WATER TREATMENT FOR HIGH PRESSURE

BOILERS, K. W. Herman, and L. R. Gelosa. Power Engineering, Vol 75, No 5, p 64-66, May

Descriptors: Water treatment, *Boilers, *Boiler feedwater, *Corrosion, Water quality control, Heat transfer, Thermal water, Conduction, Pretreatment (Water), Mechanical engineering, Steam turbines, Hydrogen, Sludge, Filtration, Volatility, Water quality control.

Along with the problems high pressure boilers share with lower pressure boilers, they also have special difficulties. Overheating can result in gross ductile distortion and rupture of metal. Fluid film concentration results in dissolved solids being concentrated in a thin film of water when ste centrated in a thin film of water when steam is formed and can cause deposits and corrosion. Diffusion of atomic hydrogen in the boiler metal produces methane gas resulting in blistering and cracking. Slica may volatilize in steam and cause deposits in turbines. The three main objectives of water treatment are to prevent scales, corrosion, and carryover. One treatment, called precision control is based on maintaining 2 to 4 ppm of phosphate and 15 to 50 ppm of hydrate alkalinity in the boiler to prevent calcium deposits and sludge buildup and to minimize silica volatilization. Coordinated phosphate pht control was developed to dinated phosphate pH control was developed to prevent caustic gouging. Volatile treatment uses hydrazine and neutralizing amines or ammonia. Purified water is also a means of preventing problems. (Jerome - Vanderbilt) W73-13440

SELECTED IRRIGATION RETURN FLOW QUALITY ABSTRACTS 1970-1971, SECOND ANNUAL ISSUE, Colorado State Univ., Fort Collins. Dept of Agricultural Engineering. For primary bibliographic entry see Field 05G. W73-13472

UPPER MISSISSIPPI RIVER COMPREHENSIVE BASIN STUDY, APPENDIX N-AGRICULTURE. Soil Conservation Service, Washington, D.C. For primary bibliographic entry see Field 06B. W73-13494

RIGHTS TO NEBRASKA STREAMFLOWS: AN HISTORICAL OVERVIEW WITH RECOMMEN-Nebraska Natural Resources Commission, Lin-

For primary bibliographic entry see Field 06E. W73-13506

GRASS AND GRASS UTILIZATION IN ICE.

LAND, Agricultural Research Inst., Reykjavik (Iceland). For primary bibliographic entry see Field 04A. W73-13510

WATER STRESS IN 'TUROA' RED CLOVER UNDER 'AOTEA' WHEAT, Lincoln Coll. (New Zealand). Dept. of Plant

C. T. Dougherty. N Z J Agric Res. Vol 15, No 4, p. 706-711. 1972. Identifiers: Clover, Moisture, *Soil water stress, Trifilium-Pratense, Triticum-Aestivum, *Wheat (Aotea), *Red clover (Turoa), New Zealand.

Red clover (Trifolium pratense L. cv. 'Grasslands Turoa') established with wheat (Triticum aestivum L. cv. 'Aotea') in Canterbury was under considerable water stress during reproductive stages of development of the cereal, even when the soil water potential in the top 15 cm was approximately-lbar. The unfavorable light and moisture environment of the red clover under wheat severely restricted prot development to a few centimeters. vironment of the red clover index mass severely restricted root development to a few centimeters of the soil surface, where much less water was available than at greater depths.—Copyright 1973, Biological Abstracts, Inc.

PROPOSED CENTRAL ARIZONA PROJECT (FINAL ENVIRONMENTAL STATEMENT). AVAILABLE FROM THE NATIONAL TECHNICAL INFORMATION SERVICE AS EIS-A2-72-3-357-F1. BUREAU OF RECLAMATION,

BOULDER CITY, NEVADA. (FES 72-35) SEP-TEM BER 1972, 597 P. MAPS. 203 REF. Bureau of Reclamation, Boulder City, Nev. Region 3. For primary W73-13552 rimary bibliographic entry see Field 04A

COMPLEX CHARACTERISTICS OF THE

WATER-HOLDING CAPACITY OF PLANT TIS-SUES, (IN RUSSIAN), M. Tyurina. Bot Zh. Vol 57, No 4, p 509-521, 1972. Illus. Identifiers: "Apple leaves, "Plant tissues, "Water storage (Plants).

The water holding potential of apple leaves of the 'Antonovka' and drought-resisting kind was investigated, using the methods of Shardavok and the Artsikhovskis with 2 mondifications. The the Artsiknovskis with 2 mondifications. The method, utilizing polyethylene bags in hermetic chambers with calibrated papers convenient for mass experiments in place of solutions, is described. A discussion of other methods is in-cluded.—Copyright 1973, Biological Abstracts, W73-13576

EFFECT OF TISSUE HYDRATION ON NITROGEN METABOLISM IN BARLEY LEAVES, (IN RUSSIAN), Leningrad State Pedagogical Inst. (USSR). N. N. Savitskaya.

Fiziol Rast. Vol 19, No 4, p 776-780. 1972. (English summary).
Identifiers: *Barley leaves, Drought, Hydration, Leaves, *Metabolism, *Nitrogen, *Tissue hydration (Plants).

The effect of drought on N metabolism was studied in barley leaves. The samples for analysis were taken after irrigation ceased and water deficiency in soil gradually increased. The total water content in leaf tissues was determined as well as protein and non-protein N. Changes in N metabolism consisted mainly in a decrease of the content of protein N. This reaction was found at the very early stages of dehydration when the total content of water slightly decreased. Dehydration resulted in water redistribution among the fractions and a decrease of the fraction of free water.—Copyright 1973, Biological Abstracts, Inc.

AGRICULTURAL CHARACTERISTICS OF THE BOTTOM LAND OF DNEPR RIVER. (IN BYELORUSSIAN),

M. F. Rakhar. Vyestsi Akad Navuk B SSR Syer Biyal Navuk, 1. p 21-27, 1972

Identifiers: *Agriculture, *Dneper River (USSR), Grass, Land, Marsh, Rivers, USSR.

Some results of a geobotanic study (1965-1970) of the plant bottom land of Dnepr from the Sozh Tributary to the Berezina Tributary (USSR) are given. The following 6 classes of plant formations were distinguished: true, settle, depleted, waste, moist meadow, and low-lying grass marsh. A total of 85 associations were found in them. Of 299 spp. recorded in the bottom land of Dnepr, 86 were poisonous plants; 36 of them were not previously recorded in White Russia-SSR (USSR).—Copyright 1973, Biological Abstracts, Inc. W73-13578

EFFECT OF AWNS AND DROUGHT ON THE SUPPLY OF PHOTOSYNTHATE AND ITS DISTRIBUTION WITHIN WHEAT EARS, Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Plant Industry.
L. T. Evans, J. Bingham, P. Jackson, and J. Sutherland.

Ann Appl Biol. Vol 70, No 1, p 67-76. 1972. Illus.

Field 03-WATER SUPPLY AUGMENTATION AND CONSERVATION

Group 3F—Conservation in Agriculture

Identifiers: *Awns, Carbon assimilation, Distribu-tion patterns, *Drought, Photosynthate, tion patterns, *Drought *Photosynthesis, *Wheat ears.

The presence of awns doubled the net photosynthetic rate of wheat ears and also increased the proportion of 14CO2 assimilated by the ear that moved to the grain. The effect of water supply on photosynthesis and movement of assimilates was created for leaves the proportion of the same property of the sa supply on photosynthesis and movement of as-similates was greater for leaves than ears, so that drought increased the proportion of assimilate contributed by ear photosynthesis to grain filling 13%-24% in the awnless ears, and 34%-34% in the awned ears. 14C assimilated by the ears was most important to the economy of the upper spikelets and to the distal florets in each spikelet, whereas flag leaf assimilate went mainly to the spikelets in the lower half of the ear and to the proximal tag lear assimilate went mainly to the spikelets in the lower half of the ear, and to the proximal florets. Awns increased grain yield in the dry but not in the irrigated treatment, despite the large contribution of awned ears to grain filling. Either the supply of assimilate did not limit grain yield when water supply was not limiting, or there were compensating disadvantages to awns. However, they did not seem to have any adverse effect on the development of the upper florets, nor did they reduce grain number per ear.—Copyright 1973, Biological Abstracts, Inc.

EFFECT ON WHEAT YIELD AND NITROGEN UPTAKE FROM MANURES MADE FROM

UPTARE FRANCES
SPENT-SLURRY,
R. D. Laura, and M. A. Idnani.
Plant Soil. Vol 37, No 2, p 283-295, 1972. Illus.
Plant Soil. Vol 37, No 2, p 283-295, 1972. Illus.
Plantificación de la confession d Identifiers: Decomposition, Flocculation, *Manures, Microbial studies, *Nitrogen, Peptizing reactions, Phosphates, *Slurry, Urea, *Wheat yield.

The use of liquid spent-slurry gave higher wheat yield and more N uptake than sun-dried slurry. The depressing effect of sun-drying on available N nne uepressing etrect of sun-drying on available N in slurry was attributed to enhanced irreversibility of the flocculative and peptizing reactions of organic colloidal matter due to desiccation and thus increased resistance to subsequent microbial decomposition and mineralization of slurry N. The absorption of liquid slurry in organic absorbents like green leaf powder, dry leaf powder, and sawdust greatly enhanced its manurial value. Its absorption in incorpanic absorbents with the control of th sorption in inorganic absorbents like charcoal dust and ash did not increase wheat yield, but N uptake was somewhat higher than sun-dried slurry. Like was somewhat higher than sun-dried slurry. Like ordinary farm compost, the composts prepared by composting liquid slurry with wheat straw and sorghum stover gave lower yield and low N uptake. The enrichment of slurry with urea and superphosphate gave a manure which has a higher manurial value than (NH4)2SO4 on equivalent N basis.—Copyright 1973, Biological Abstracts, Inc. W73-13601

AN EXPERIMENT DETERMINING THE TOTAL EVAPORATION FROM A FIELD OF A PLANNED IRRIGATION BLOCK OF LAND IN SSR, (IN RUSSIAN),
For primary bibliographic entry see Field 02D.
W73-13605

EFFECT OF SUBSTRATE HUMIDITY CONDI-TIONS ON LETTUCE AND SPINACH MINERAL NUTRITION. 1. EFFECT OF HUMIDITY ON PLANT YIELD (IN RUSSIAN), Akademiya Nauk Latviiskoi SSR, Riga. Inst. of

G. Rinkis, and G. Paegle. Latv Psr Zinat Akad Vestis. 11. p 22-28, 1971, IIlus, English summary.

Identifiers: *Humidity (Substrate), *Lettuce,
Mineral nutrition, Plant, *Spinach, Crop yield.

In 1 experiment lettuce plants were cultivated at 5 levels of constant substrate humidity: 20%, 35%,

50%, 65%, 80% of the total moisture capacity. In a second experiment, spinach plants were cultivated at first according to the same scheme, but on the 16th day the humidity was raised (from 20%-50%, from 50%-80%, from 20%-80%) or lowered (from trom 30%-50%, trom 80%-50%, from 80%-50%, from 80%-50%, from 80%-50%. The optimum humidity of substrate for lettuce and spinach under the conditions of experiment was 50%-65%. The minimum yield of lettuce was obtained at 80%, that of spinach at 20%.—Copyright 1973, Biological Abstracts, Inc.

04. WATER OUANTITY MANAGEMENT AND CONTROL

4A. Control of Water on the Surface

HYDRA: DYNAMIC MODEL FOR URBAN HYDROLOGIC SYSTEMS, Nebraska Univ., Lincoln. Dept. of Computer

A I Surkan

Available from the National Technical Information Service as PB-222 486, \$4.75 in paper copy, \$1:45 in microfiche. Nebraska Water Resources Research Institute Project Completion Report, July 1973. 156 p, 13 fig, 2 tab, 4 ref, 4 append. OWRR B-016-NEB (2). 14-31-0001-36ll.

Descriptors: Channels, *Computer models, Net-works, Runoff, Routing, *Simulation analysis, *Urban hydrology, *Computer programs, *Storm runoff, Urban runoff, Rainfall runoff relation-ships.

The design and application are described of HYDRA, a new package of computer programs designed for the detailed modeling of the routing of water in converging channel networks. Geomet ric characteristics of intricate systems consisting of arbitrarily large numbers of channel segments can be considered. Accounted for in the simi model are the relationships of the channel segments to each other, to surrounding areas, and to the rainfall variations and/or movement of storms. Storms are described as regions enclosed by boundaries approximated by any arbitrary number of polygon sides. The degree of detail with which either the network or storm patterns are defined may be chosen by the user. Results from this modeling package include, for finite storm events, the runoff rate and accumulated rainfall at any specified point on the network. With spatially uniform storms specificable as lengthy unevenly sampled rainfall records, the result is a simulated continous streamflow record. In both cases, during the simulation there is a computation of several statistical estimators of the generated flow variations. The estimators computed include: mean time of arrival for the water, mean and variance of its flow rate, and the time and value of the flow rate maximum. The performance of the HYDRA package, in simulating the effect of uniform timevarying storms over an urban drainage network has been tested with ten sets of rainfall and runoff data from the Northwood area of Baltimore, Maryland. Comparisons of the simulated and ob-served runoff show excellent agreement using a model with only two or fewer parameters. The two scale parameters enter only as linear factors related to the overall system losses and travel tim in the channels. Once they are known, the model is essentially parameter free and therefore is highly attractive for the simulation of flows at ungaged oints of a network.

HIGH-LIFT PUMPING AND THE IMPACT UPON ECONOMIC DEVELOPMENT OF DESERT LAND IN IDAHO, Idaho Univ., Moscow. Dept. of Agriculture. For primary bibliographic entry see Field 03F. W73-13027

PROBLEMS IN HYDROLOGY, Texas Univ., Austin. Center for Research in Water For primary bibliographic entry see Field 02A.

PRELIMINARY STUDY OF POTENTIAL SITES FOR WATER-SUPPLY RESERVOIRS IN WEST AND SOUTHEAST ALABAMA, Geological Survey of Alabama, University. For primary bibliographic entry see Field 06D.

A DECADE OF JUDICIAL DEVELOPMENTS AND CHANGES IN COLORADO WATER LAW: 1960-1970, Colorado State Univ., Fort Collins. Dept. of For primary bibliographic entry see Field 06E.

A MINIMUM COST WATER DISTRIBUTION NETWORK, Michigan Univ., Ann Arbor. Dept. of Environ-mental and Industrial Health.

mental and industrial Health.

J. S. Hsu, and R. A. Deininger.

Research Report, UMICH-ENVSA-71-04,
University of Michigan, School of Public Health,
Ann Arbor, June 1971. 17 p, 6 fig, 2 ref, 1 append.

OWRR-A-041-MICH (2).

Descriptors: *Water distribution (Applied), *Net-works, *Linear programming, *Computer pro-grams, *Algorithms, *Pipes, Size, Flow, Pressure, Data collections, Hydraulics, Mathematical models, Systems analysis. Identifiers: *Cost minimization.

An algorithm and computer program which deter-mine a least cost water distribution network are described. The network is assumed to be of a tree form and the algorithm used selects that combination of pipe sizes which minimize the total costs of the network while delivering the required flows at the required pressures at all points. The problem is the required pressures at all points. The problem is formulated using linear programming. The computer program is written in FORTRAN IV, and is to be executed in batch mode under the MTS System of the University of Michigan. It consists of a main program and five sub-programs. Presented are: Deck set-up for batch users, a list of data input variables, control cards, the main program and its five sub-programs output. (See also W73-13072 and W73-13073) (Bell-Cornell)

DESIGN OF OPTIMAL WATER DISTRIBUTION NETWORKS USING DYNAMIC PRO-NETWORKS USING DYNAMIC PRO-GRAMMING, Michigan Univ., Ann Arbor. Dept. of Environ-mental and Industrial Health.

Research Report, UMICH-ENVSA-71-6, University of Michigan, School of Public Health, Ann Arbor, July 1971. 20 p, 2 fig, 1 tab, 1 append. OWRR-A-041-MICH (3).

Descriptors: *Dynamic programming, *Design, *Water distribution (Applied), *Networks, *Optimization, *Computer programs, *Pipes, Size, Annual, Capital costs, Constraints, Decision making, Project planning, Alternative planning, Hazen-Williams equation, Pressure, Water resources development, Economics, Mathematical models, Systems analysis.

WATER QUANTITY MANAGEMENT AND CONTROL-Field 04

Control of Water on the Surface-Group 4A

Identifiers: Decomposition techniques.

Identifiers: Decomposition techniques.

Dynamic programming is used in analyzing a large number of system alternatives to design an optimal water distribution network. For this problem formulation, the annual capital costs for meeting discharges and pressures at various points are used. The cost is primarily that of the pipes. The length of a section of the network is given and may comprise pipes of different diameters and qualities; the quality is expressed using the Hazen-Williams formula. Using decomposition techniques, the cost expression can be broken down into a formula in which the transformations and constraints are explicitly defined for each stage. Stagewise optimization is readily achieved, and the problem is converted from a multiple decision single-stage problem into a multiple stage single-decision problem. A computer program is presented which selects the most economical pipe sizes for a water distribution network under given requirements or constraints regarding the discharges and pressures at various points in the network. (See also W73-13071) (Bell-Corneil)

AN INTERACTIVE DESIGN SYSTEM FOR WATER DISTRIBUTION NETWORKS, Michigan Univ., Ann Arbor. Dept. of Environmental and Industrial Health.

T. J. Carlson, J. S. Hsu, and R. A. Deininger.
Research Report, UMICH-ENVSA-71-5, University of Michigan. School of Public Health, Ann Arbor, July 1971, 9 p., 3 fig, 3 ref, 2 append. OWRR-A-041-MICH (4).

Descriptors: "Water distribution (Applied), "Networks, "Design, "Computer programs, Evaluation, Economic feasibility, Optimization, Pipes, Costs, Hydraulics, Data collections, Operations research, Mathematical models.

research, Mathematical models.

A highly interactive system for the design of a water distribution network is described. The system of computer programs allows a designer to use a cathode-ray tube display terminal and evaluate in rapid succession alternate networks with the aim of finding an efficient one. Hopefully, by being able to evaluate many networks in a short time, the designer may come close to the optimal, least cost network. The specific terminal used in this study is a DEC 338 Cathode Ray Tube Graphics Terminal, which may be connected via telephone lines to the central computing facility at the University of Michigan which consists of an IBM 360 67 computer. Associated with the graphic terminal is a group of subroutines. The basic design system for evaluating and finding an effective water distribution network consists of a series of FORTRAN IV coded programs and subroutines which allow the designer a rapid evaluation of alternate networks. The problem is partitioned into two subproblems: (1) find a least cost network (this can be solved by linear or dynamic programming and is described in detail elsewhere); (2) find a good configuration for the network. This is done heuristically on the CRT, and consists of a program which allows the display of a network and its interactive change. (Bell-Cornell)

THE EFFECT OF GROUND WATER LEVEL ON WATER MOVEMENT IN PEAT: A STUDY USING TRITIATED WATER, Macaulay Inst. for Soil Research, Aberdeen (Scot-

iano). A. H. Knight, R. Boggie, and H. Shepherd. J Appl Ecol, Vol 9, No 2, p 633-641, 1972. Illus. Identifiers: Drainage, Ground water, *Peat, Topography, *Tritiated water, *Water levels.

Tritium was used to trace water movement through peat in 5 plots in which the water tables were maintained at different depths of 0-0.34 m below the surface. Tritiated water was applied to the surface of the peat and at intervals of time, up

to 54 wk after application, peat below and adjacent to the treated areas was sampled and analyzed for radioactivity. Both downward and lateral move-ment was detected and these were related to the drainage treatments and topography.—Copyright 1973, Biological Abstracts, Inc. W73-13093

ROOT DISTRIBUTION AND SOIL MOISTURE STUDIES IN SOME PERENNIAL RYEGRASS AND PHALARIS PASTURES ON SOUTHERN TABLELANDS, SOUTH-EASTERN AUS-

Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Plant Industry.

For primary bibliographic entry see Field 02I. W73-13110

INTERNATIONAL SYMPOSIUM ON UNCER-TAINTIES IN HYDROLOGIC AND WATER RESOURCE SYSTEMS, VOL. II.

Available from University of Arizona Tucson, Dept. of Hydrology and Water Resource, 522.00 a set. Proceedings (Vol. II), International Symposi-um on Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tuc-son, Dec 11-14, 1972. p 450-933.

Descriptors: "Water resources development, "Planning, "Management, "Decision making, "Economics, "Systems engineering, "Stochastic processes, "Simulation analysis, "Hydrology, Data collections, Projects, Hydraulics, Time, Technology, Systems analysis, Mathematical models, Analytical techniques, Streamflow forecasting, Computer programs, Probability, Optimization, "Risks.

Identifiers: Data worth, Urban water manage

This is the second of three volumes on a symposium which focuses upon the role of the decision sciences in evaluating uncertainties inherent in water resource planning, design, investment, and operations. (See also W73-12269, and W73-13135 thru W73-13136) (Bell-Cornell)

PROBLEMS OF ANALYTICAL METHODS IN HYDROLOGIC DATA COLLECTIONS, Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 07C.
W73-13135

CLIMATIC UNCERTAINTY EFFECTS ON MANAGEMENT AND DESIGN OF RESERVOIR-IRRIGATION SYSTEMS, Montana State Univ., Bozeman. Dept. Economics and Agricultural Economics. For primary bibliographic entry see Field 03F. W73-13137

THE LINEAR DECISION RULE IN RESERVOIR MANAGEMENT AND DESIGN, 3, DIRECT CAPACITY DETERMINATION AND INTRASEASON CONSTRAINTS, TRASEASON CONSTRAINTS,
Johns Hopkins Univ., Baltimore, Md.
J. Eastman, and C. ReVelle.
In: Proceedings (Vol. II), International Symposium on Uncertainties in Hydrologic and Water
Resource Systems, University of Arizona, Tucson, December 11-14, 1972. p 519-537, (1972) 1 tab,
7 ref, 1 append.

Descriptors: "Multiple-purpose reservoirs, "Design, "Management, "Constraints, "Linear programming, "Decision making, Seasonal, Storage, Water supply, Recreation, Flood control, Mathematical models, Systems analysis. Identifiers: Capacity, Intraseason, Water releases.

A probabilistic model for multi-purpose reservoir operation is reviewed and extended. The model minimizes required capacity subject to chance constraints for water supply, recreation and flood control. A linear decision rule is used to make commitments based on existing storage. A study of the structure of this linear programming formu-lation reveals a direct solution in the special case when as much water as possible is reliably committed, a reasonable case for water supply. The structure of the model requires an adequate degree of continuity, generally restricting the model's usage to multi-purpose reservoirs. Using an execution rule to specify when within a decision period water will be released, the model is extended to inwater will be released, the model is extended to in-clude constraints on storage within a decision period. Increasing the length of a decision period produces a large increase in reservoir capacity due produces a large intereste in reservoir capacity due to making commitments for a longer future of un-certain inflows. Numerical examples are provided which demonstrate the increased capacity required in a seasonal model over that required in a monthly model and the effect of using in-traseason constraints. (See also W73-13134) (Bell-Cornell) W73-13138

'EXTENDED-RANGE' METEOROLOGICAL FORECASTS APPLIED TO MULTI-RESE-RVOIR MANAGEMENT DECISIONS, Department of the Air Force, Scott AFB, Ill. For primary bibliographic entry see Field 02A. W73-13139

MODELLING THE REGULATION OF LAKE SUPERIOR UNDER UNCERTAINTY OF FU-TURE WATER SUPPLIES,

Sun Oil Co., Dallas, Tex. S. Y. Su, and R. A. Deininger.

In: Proceedings (Vol. II), International Symposi-um on Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tucson, December 11-14, 1972. p 555-575, (1972) 8 fig, 2 tab, 13 ref.

Descriptors: *Lake Superior, *Regulation, *Water supply, *Future planning (Projected), *Markov processes, *Optimization, Stochastic processes, Reservoirs, Operation and maintenance, Water levels, Water loss, Economics, Mathematical models, Systems analysis, *Risks.

The problem of regulating Lake Superior via con-trol at its outlet is considered. Monthly inflows to the reservoir are treated as stochastic random vari-ables, and are assumed to be either statistically inables, and are assumed to be either statistically in-dependent or correlated with the preceding month's inflow. The purpose was to find operating policies for the system which minimize the ex-pected yearly losses in the undiscounted case, or the total expected losses over an infinite time horizon if the future losses are discounted. The system is modelled as a periodic Markovian decisystem is modelled as a periodic Markovian decision problem. A general one-reservoir regulation system is described and an optimization model is developed. A new algorithm based on White's method of successive approximations for solving single-chained and completely ergodic Markovian decision problems has been developed and proven to be fairly efficient in terms of computer storage and computation. Transition probabilities of the net basin supplies are estimated from 64 years of data. Economic loss functions used in the model consist of losses due to navigation inconvenience and to shore property damage. An extensive senand to shore property damage. An extensive sensitivity analysis was conducted to determine their influence on the optimal operating policies. Results show the definite possibility of reducing average yearly losses by at least 15% and monthly lake level variances by 25%. (See also W73-13134) (Bell-Comell)

Field 04-WATER QUANTITY MANAGEMENT AND CONTROL

Group 4A-Control of Water on the Surface

RESERVOIR MANAGEMENT: OPTIMAL PRIC-ING AND RATIONING POLICIES UNDER UN-

ING AND BAY, CERTAINTY, Wontpellier Univ. (France). Faculte des Sciences. A. Lobert, A. B. Whinston, and G. P. Wright. In: Proceedings (Vol. II), International Symposities and Water and um on Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tuc-son, December 11-14, 1972, p 576-591, (1972). 2 fig, 20 equ, 11 ref.

Descriptors: *Reservoir operation, *Management, *Optimization, *Pricing, *Rationing (Water), *Water allocation (Policy), *Water supply, Water demand, Water delivery, Stochastic processes, Mathematical models, Systems analysis, *Risks. Identifiers: *Water consumers, Social benefits.

This paper extends some previous work by Thomas, Whinston, and Wright, of allocating a stochastic amount of water where the parameter 'guaranteed probability of delivery' is a decision variable along with selling price in the demand functions. The water consumer sector is considered explicitly. Reviewed first are some of the results obtained from analysis of allocation models for selling water at different prices and different guaranteed delivery probabilities. Considered next is the water consumer sector, and the problem of estimating the demand functions and selling prices of different classes of water consume ferentiated by guaranteed delivery probability is discussed. Presented is an iterative and coordinative procedure for the estimation of demands, prices, and guaranteed delivery probabilities for water for a multi-period model where the supply of water, over time, is assumed to be a stochastic process. (See also W73-13134) (Bell-Cornell) process. (Se W73-13141

AN ANALYSIS OF SAMPLING-FREQUENCY ALTERNATIVES FOR FITTING A DAILY STREAM-TEMPERATURE MODEL, Geological Survey, Washington, D.C. E. J. Gilroy, and T. D. Steele.

In: Proceedings (Vol. II), International Symposium on Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tucson, December 11-14, 1972. p 594-608, (1972). 13

Descriptors: Hydrology, *Streams, *Temperature, *Measurement, *Statistical models, *Sampling, *Frequency, Distribution, Analytical techniques, Systems analysis.
Identifiers: Daily, Harmonic parameters.

Daily stream-temperature measurements are fitted to a trigonometric regression model by using only observations obtained every I-th day in a given year for various values of I. The year-to-year variation of the parameters of the regression model has remained small over the values of I equal 1-, 7-, or 30-day increments. The largest increase in the coefficients of variation of the parameters was .04 for the amplitude of the haronic in the case of I ± 30. A split-sample technique was used to estimate a frequ tribution of the absolute value of the residuals between observed stream temperatures and stream temperatures estimated from the harmonic function. The estimated stream temperatures are determined from a sine function fitted to only every J-th daily temperature measurement for J \pm 1, 8, 15, 22, 29 in a given base year. A sample ency distribution analysis of the residuals indicated that less-than-daily sampling frequencies give estimates of annual variation of stream temperatures that are comparable to estimates obtained from a daily sampling scheme. (See also W73-13134) (Bell-Cornell)

ESTIMATING BENEFITS TO IMPROVED ESTUMATING BENEFITS TO IMPROVED SEASONAL WATER SUPPLY FORECASTS: A CASE STUDY OF IRRIGATION BENEFITS, Battelle Memorial Inst., Columbus, Ohio. For primary bibliographic entry see Field 03F. W73-13143

BAYESIAN HYDROLOGIC MODEL BUILDING, Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering. For primary bibliographic entry see Field 02A. W73-13144

INFORMATION CONTENT OF THE RE-GIONAL MEAN. Pittsburgh Univ., Pa. Dept. of Civil Engineerin For primary bibliographic entry see Field 02A.

DEVELOPMENTS IN APPLICATIONS OF REMOTE SENSING TO HYDROLOGIC MODELING,

IBM Space Systems Center, Huntsville, Ala. For primary bibliographic entry see Field 02E. W73-13146

DESIGN OF EXPERIMENTS FOR ESTIMATING

PROCESS DYNAMICS, Queen's Univ., Kingston (Ontario). Dept. of D. G. Watts, and G. M. Minich.

In: Proceedings (Vol. II) International Symposium on Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tuc-son, December 11-14, 1972. p 677-690, (1972). 23

Descriptors: *Dynamics, *Design criteria, Esti-mating, Control, Optimization, Model studies, Equations, Systems engineering, Planning. Identifiers: Experiments, Autoregressive input.

The design of experiments involves first, careful ane design of experiments involves first, careful description of the experimental system, second, characterization of the properties of the estimates which may be obtained, and third, choice of the design points or of a rule for determining the design points so as to optimize those properties according to the design criterion. The experiment cording to the design criterion. The problem of identification of system dynamics is an important one to hydrologists. Much work has been done, one to hydrologists. Much work has been done, from different starting points and with different perspectives and philosophies; a difficulty with this is the evolution of different nomenclature in each field, such as in the use of the term 'system identification.' The problem is discussed of desig-ning an invalve to dynamic system in order to be ning an input to a dynamic system in order to best estimate the parameters in the model, according to some design criterion. General requirements of dynamic experimental designs are discussed. Two criteria are selected and applied to the simple case of discrete first-order dynamics. Design criteria used are precise estimation and precise control Optimal input signals for these cases are derived and similarities and differences between the two criteria are explored. Extensions of the model are made to exported. Extensions of the model are made to expose the sensitivity of the optimal inputs to changes in the assumed model, and to stress the necessity for multiple criteria of experimental design. (See also W73-13134) (Bell-Cornell)

STRATEGIC UNCERTAINTY AND THE NATIONAL ENVIRONMENTAL POLICY ACT, Environmental Defense Fund, East Setauket,

For primary bibliographic entry see Field 06B. W73-13148

THE IMPACT OF WATER RESOURCES ON THE LOCATION OF ECONOMIC ACTIVITIES, Technische Hochschule, Munich (West Germany).

For primary bibliographic entry see Field 06D. W73-13149

SUBJECTIVE PLANNING: A MODEL FOR WATER RESOURCE DEVELOPMENT, General Telephone Co. of the Southwest, San Angelo, Tex. For primary W73-13150 nary bibliographic entry see Field 06A.

PROBLEMS OF WATER RESOURCE DEVELOPMENT IN THE GULF COAST ESTUARINE ZONE Forest Service (USDA), New Orleans, La. Southern Forest Experiment Station. For primary bibliographic entry see Field 02L. W73-13152

SOME POSSIBLE CHANGES IN FUTURE SO-CIAL VALUES AND PRIORITIES: STRATEGIC IMPLICATIONS FOR WATER RESOURCES PLANNING, Institute for Water Resources (Army), Alexandria,

For primary bibliographic entry see Field 06B. W73-13153

TREATMENT OF SOME OF THE UNCERTAINTIES ENCOUNTERED IN THE CONDUCT OF COST-EFFECTIVENESS EVALUATIONS. North American Rockwell Corp., Downey, Calif. Space Div. For primary For primary bibliographic entry see Field 06B. W73-13154

A REPORT ON CORPS OF ENGINEERS RESEARCH ON THE MANAGEMENT OF UNCERTAINTY IN WATER RESOURCES CERTAINTY PLANNING, Decision Sciences Corp., Jenkintown, Pa. For primary bibliographic entry see Field 06B. W73-13155

RELIABILITY: A NEW PARAMETER IN URBAN WATER QUALITY MANAGEMENT, Texas A and M Univ., College Station. Dept. of Industrial Engineering. For primary bibliographic entry see Field 05D. W72.1215.

THE MARGIN OF SAFETY FOR COMPENSATING LOSSES DUE TO UNCERTAINTIES IN HYDROLOGICAL STATISTICS, Research Inst. for Water Resources Development, Budapest (Hungary). For primary bibliographic entry see Field 06B. W73-13157

UNCERTAINTY IN THE RETURN PERIOD OF MAXIMUM EVENTS: A BAYESIAN AP-PROACH. Arizona Univ., Tucson. Dept. of Hydrology and Water Resources. imary bibliographic entry see Field 02B.

HYDROLOGIC AND HYDRAULIC DESIGN UNDER UNCERTAINTIES, Illinois Univ., Urbana. Dept. of Civil Engineering. For primary bibliographic entry see Field 08B.

DRY FARMING: UNCERTAINTY IN LAND AND WATER PRODUCTIVITY, Arizona Univ., Tucson.
For primary bibliographic entry see Field 03F.
W73-13160

WATER QUANTITY MANAGEMENT AND CONTROL—Field 04

Control of Water on the Surface—Group 4A

OPTIMAL DESIGN STRATEGY FOR SMALL FLOOD-CONTROL STRUCTURES, Queen's Univ., Kingston (Ontario). For primary bibliographic entry see Field 08B. W73-13161

THE SENSITIVITY OF RETURN PERIODS TO VARIATIONS IN RETENTION LEVELS FOR DIFFERENT DEFINITIONS OF SHORTAGE, Lancaster Univ., Bailrigg (England).

J. C. WIKEINSON.
In: Proceedings (Vol. II), International Symposium on Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tuc-son, December 11-14, 1972. p 917-925, (1972). 1 son, December

Descriptors: *Multiple-purpose reservoirs, *Reservoir storage, *Water shortage, *Reliability, *Water supply, *Flood control, Measurement, Vater yield improvement, Seasonal, Runoff, Probability, Mathematical models, Systems analy-

Identifiers: *Retention levels, *Llyn Celyn reservoir (North Wales), *River Dee (Wales).

In 1965, the Llyn Celyn regulating reservoir in North Wales was completed, primarily to augment the natural yield of the River Dee, but also for flood control. Monthly retention levels were established on an ad hoc basis and the system has operated effectively ever since. However, there operated effectively ever since. However, there exists no definition of what level of reservoir storage constitutes shortage, and consequently no measure of the reliability of the system. The River Dee Regulation Research Programme has derived optimal retention levels. Their derivation depends upon the repeated use of a recursive probabilistic model which uses estimates of the correlated probability distributions of runoff in the controllable and uncontrollable parts of the catchment for the west of the west for the model of the search most of the model of the search most of the model or ble and uncontrollable parts of the catchment for each month of the year. The use of the model to evaluate the present retention levels has suggested that perhaps more importance is attached, implicitly, to the secondary but more immediately perceived objective of mitigating floods than the primary aim of maintaining supply. Use of the model to explore, for different definitions of failure of the system, the dependence of return periods upon the monthly retention levels is described. Optimal retention levels for different desired return periods of shortage are compared with present operating levels. (See also W73-13149 (Bell-Cornell)

CONCERNING THE CALCULATION OF LEVEL VERIATION OF CUTOFF WATER BALANCE,

Gruzinskii Nauchno-Issledovatelskii Gidrotekhniki i Melioratsii, Tiflis (USSR).

Gidroteknniki i Medoratsu, i futs (USSR).

I. V. Khomeriki.

In: Proceedings (Vol. II), International Symposium on Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tucson, December 11-14, 1972. p 926-933, (1972). 1

Descriptors: "Water balance, "Monte Carlo method, "Stochastic processes, "Probability, "Hydrology, Influents, Withdrawal, Lakes, Basins, Mathematical models, Systems analysis. Identifiers: "Closed water bodies, "Water level.

The calculation of expected levels of closed lakes is close to the general problems of water economy systems, although difficulties of such calculations have specific character connected primarily with withdrawal of water from influents and directly from water bodies for the development of irrigated farming and water consuming industry. Secondly, the difficulties of such calculations are associated with the stochastic character of hydrological and meteorological processes as the components of the meteorological processes as the components of the water body balance to be taken into account. Presented are some considerations relating to the

constructions of a calcuated model of the regime of a closed water body based on the Monte Carlo method. The following principle forms a basis for constructing the model: A single law of distribution is selected for probabilistic processes and the models of all components of the balance, based on the hypothesis of ergodicity, are to be game-played and the water balance calculations performed. (See also W73-13134) (Bell-Cornell) W73-13164 W73-13163

MAGNITUDE AND FREQUENCY OF FLOODS IN SMALL DRAINAGE BASINS IN IDAHO--A DESIGN METHOD, Geological Survey, Boise, Idaho. C. A. Thomas, W. A. Harenberg, and J. M.

Geological Survey open-file report, April 1973. 43 p, 11 fig, 4 tab, 15 ref, append.

Descriptors: "Flood forecasting, "Flood frequency, "Flow characteristics, "Streamflow, "Idaho, Methodology, Regression analysis, Mathematical studies, Equations, Peak discharge, Topography, Geology, Vegetation, Land use.

A method is described for estimating peak discharges at 10-, 25-, and 50-year recurrence in-tervals for most small streams in Idaho. Reliable estimates can be obtained using this method, but there are significant limitations and variations which should be considered. The method is for sites on streams with natural flow. Estimates of sites on streams with natural flow. Estatates of peak discharge may be poor for streams draining basins on, or flowing across, extensive areas of deep, coarse alluvium or lava flows; for streams whose basins are urbanized; for streams draining irrigated agricultural lands; and for streams draining basins having less than about 30% forest cover. Computed flows in those parts of the State subject to recurrent high intensity thunderstorms over small areas may be too low to be acceptable as reasonable estimates. Some anomalous areas have been identified where the method developed does not apply. (Woodard-USGS)

W73-13208

FUNCTIONAL AND PSYCHOLOGICAL IN-TEGRATION IN A RURAL COMMUNITY, Pennsylvania State Univ., University Park. Dept. of Agricultural Economics and Rural Sociology. For primary bibliographic entry see Field 06B. W73-13305

EFFELT OF PLANT MOISTURE STRESS ON CARBOHYDRATE AND NITROGEN CONTENT OF BIG SAGEBRUSH, Utah Univ., Salt Lake City. Dept. of Biology. For primary bibliographic entry see Field 021. W73-13309 EFFECT OF PLANT MOISTURE STRESS ON

THE PLANT ECOLOGY OF UTAH'S DESERT RANGELANDS, Utah State Univ., Logan. Dept. of Range Science. For primary bibliographic entry see Field 02I. W73-13310

PRODUCTIVITY OF TALL WHEATGRASS AND GREAT BASIN WILDRYE UNDER IRRIGATION ON A GREASEWOOD-RABBITBRUSH RANGE SITE, Agricultural Research Div. For primary bibliographic entry see Field 03B. W73-13314

RESPONSES OF SEMIDESERT GRASSES TO SEASONAL REST.

Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.

Journal of Range Management, Vol 26, No 3, p 165-170, May 1973. 6 fig, 6 tab, 9 ref.

Descriptors: *Range management, *Forage grasses, *Seasonal, Environmental effects, *Plant growth, Range grasses, *Arizona, Ranges, Rainfall, Vegetation regrowth, Semiarid climates, Grazing, Spring, Summer, Winter, Weather, Forages, Droughts. Identifiers: *Santa Rita Experimental Range (Ariz), Annuals, Perennials.

Ranging from continuous year-long grazing to year-long rest 2 years out of 3, 15 schedules of rest and grazing of perennial grasses on semidesert range in southern Arizona were evaluated from 1962 to 1969. Over this 8 year period springssummer rest 2 years out of 3 produced the greatest improvement in the stands of perennial grasses. While herbage yields of annual grasses were negatively related to rainfall of the preceding June-Laurery, wields of perennial grasses were more tively related to rainfall of the preceding June-January, yields of perennial grasses were more closely associated with the sum of current and past summer rainfall. This study indicates also that under any grazing system forms standard with summer rainfall. This study indicates also that under any grazing system forage stands will improve during favorable growing seasons and decline during droughts and that the impact of weather on vegetation changes is often greater than the influence of management. Currently, a pilot test of a 3-pasture grazing system providing spring-summer rest 2 years in 3 is being conducted on the Santa Rita Experimental Range and is expected to demonstrate benefits to the range, the livestock, and the rancher. (Gloyd-Arizona) W73-13318

METHODS FOR SEEDING THREE PERENNIAL WHEATGRASSES ON CHEATGRASS RANGES IN SOUTHERN IDAHO, Agricultural Research Service, Reno, Nev. Plant Science Research Div. G. J. Klomp, and A. C. Hull, Jr. Journal of Range Management, Vol 25, No 4, p 266-268, July 1972. 1 fig, 1 tab, 12 ref.

Descriptors: "Wheatgrasses, "Seeds, "Planting management, "Idaho, Ranges, "Range grasses, Range management, Forage grasses, Deep tillage, Fallowing, Rainfall, Autumn, Herbicides, Plant growth, Crop production, Germination. Identifiers: "Cheatgrass.

Throughout southern Idaho cheatgrass, an in-troduced winter annual, occupies vast areas, producing good forage and displaying an aggres-sive growth pattern. Nonetheless, it has many un-desirable characteristics. Major one are early dryproducing good forage and displaying an aggresive growth pattern. Nonetheless, it has many undesirable characteristics. Major one are early drying, high fire hazard, a short green-feed season, variable production is often replaced by weedy plants and is susceptible to replacement by medusahead. Efforts to improve the value of these rangelands by establishing more desirable perennial grass cover led to this study of planting techniques in dense stands of cheatgrass. Seeded grass stands were successful when cheatgrass was reduced to 12 plants per square foot during the initial growing season. Deep furrow drilling in the fall gave the best stands, followed by fall cultivation and drilling, and then by summer fallow and drilling. In low rainfall areas fall seeding is recommended especially when cheatgrass has germinated early and rather completely. While not a recommended control, treatment with herbicides followed by drilling gave good seeded stands the first year. Seeding success was directly related to the kill of cheatgrass. (Gloyd-Arizona) W73-13319 W73-13319

APPLICATION OF A SIMPLE HYDROLOGIC MODEL FOR RAINFALL-RUNOFF RELATIONS OF THE DALTON WATERSHED, Technion - Israel Inst. of Tech., Haifa. Dept. of Civil Engineering. For primary bibliographic entry see Field 02A. W73-13362

Field 04-WATER QUANTITY MANAGEMENT AND CONTROL

Group 4A-Control of Water on the Surface

TECHNIQUE FOR IMPLICIT DYNAMIC ROUT-ING IN RIVERS WITH TRIBUTARIES, National Weather Service, Silver Spring, Md. Office of Hydrology. For primary bibliographic entry see Field 02E. W73-13363

USE OF CROSS CORRELATION BETWEEN HYDROLOGICAL TIME SERIES TO IMPROVE ESTIMATES OF LAG ONE AUTOREGRESSIVE PARAMETERS,
Institute of Hydrology, Wallingford (England).
For primary bibliographic entry see Field 07C.
W73-13364

ONE-DIMENSIONAL CONSOLIDATION OF A CLAY LAYER WITH IMPEDED DRAINAGE BOUNDARIES, Ilbaois Univ., Urbana. Dept. of Civil Engineering. For primary bibliographic entry see Field 02G. W73-13368

EFFECT OF ACCRETION ON DYNAMICS OF GROUNDWATER BETWEEN TWO CHAN-NELS, Slovenska Akademie Vied, Bratislava (Czechoslovakia). Ustav Hydrologie a Hydrauliky. For primary bibliographic entry see Field 02F. W72.13372.

GROUNDWATER HYDROLOGY OF PRAIRIE POTHOLES IN NORTH DAKOTA, Geological Survey, Washington, D.C. For primary bibliographic entry see Field 02F. W73-13383

UPPER MISSISSIPPI RIVER COMPREHENSIVE BASIN STUDY: VOLUME I, MAIN REPORT. For primary bibliographic entry see Field 06B. W73.1380.

UPPER MISSISSIPPI RIVER COMPREHENSIVE BASIN STUDY, APPENDIX I-FLOOD CON-TROIL. Army Engineer District, Chicago, Ill. For primary bibliographic entry see Field 06B.

W73-13489

UPPER MISSISSIPPI RIVER COMPREHENSIVE BASIN STUDY, APPENDIX J-NAVIGATION. Corps of Engineers, Chicago, Ill. North Central Div. For primary bibliographic entry see Field 06B.

UPPER MISSISSIPPI RIVER COMPREHENSIVE BASIN STUDY, APPENDIX Q-FRAMEWORK FOR DEVELOPMENT. For primary bibliographic entry see Field 06B. W73-13497

PATHOGENICITY OF FUNGI AND BACTERIA FROM INDIA TO HYDRILLA AND WATER-HYACINTH, Florida Univ., Gainesville. Dept. of Plant Patholoev.

For primary bibliographic entry see Field 05C. W73-13502

PATHOGENICITY OF RHIZOCTONIA SOLANI TO AQUATIC PLANTS, Florida Univ., Gainesville. Dept. of Plant Patholo-

gy. For primary bibliographic entry see Field 05C. W73-13503 GRASS AND GRASS UTILIZATION IN ICE-LAND, Agricultural Research Inst., Reykjavik (Iceland). S. Fridriksson. Ecology. Vol 53, No 5, p 785-796, 1972. Illus. Identifiers: Cattle, Control, "Erosion, Fodder, "Grass, Human population, "Iceland, Ponies,

The total area of Iceland is approximately 103,500 km2 of which 40,000 km2 presumably was covered with vegetation at the time of settlement in 874 A.D. During the 1100 yr of occupancy, serious erosion has taken place, resulting in the deterioration of the grassland. At present, the total area of vegetation is only 20,000 km2 giving an average annual erosion rate of 20 km2. As the human population, which reached 80,000 individuals during the Age of Settlement, relied to a great extent on animal products it was indirectly dependent on the output of the natural grassland that dwindled with time and thus the human population decreased up to the last century. With modern cultivation techniques, crossion is gradually being checked and it has been possible to provide fodder for the nation's increased livestock. Today the natural grassland, which to some extent is overstocked, provides summer pasture for 800,000 sheep and 30,000 ponies while the lowland pastures around 40,000 ponies while the lowland pastures around the homesteads supply grazing for 60,000 dairy cattle. Sheep and cattle are housed and fed indoors on hay and artificial feeds during the winter months. Half the fodder is now obtained from cultivated land. Thus the Icelandic agriculture is, at present, capable of supporting a nation of 200,000 individuals..-Copyright 1973, Biological Abstracts, Inc.

A SURVEY OF THE WATER RESOURCES OF ST. THOMAS, VIRGIN ISLANDS, Geological Survey of Puerto Rico, San Juan. For primary bibliographic entry see Field 02A. W73-13516

ECONOMIC CRITERIA FOR DECISIONS ON PRESERVATION AND USE OF INLAND WET-LANDS IN MASSACHUSETTS, Massachusetts Univ., Amberst. Dept. of Agricultural and Food Economics. For primary bibliographic entry see Field 06B. W73-13518

FLOOD OF MARCH 19-20, 1970, METROPOLITAN BIRMINGHAM AND JEF-FERSON COUNTY, ALABAMA, Geological Survey, University, Ala. For primary bibliographic entry see Field 07C. W73-13521

A MATHEMATICAL MODEL FOR PRELIMI-NARY EVALUATIONS OF CANDIDATE RESERVOIR SYSTEMS, Army Engineer Waterways Experiment Station, Vicksburg, Miss. For primary bibliographic entry see Field 08D. W73-13529

PROPOSED CENTRAL ARIZONA PROJECT (FINAL ENVIRONMENTAL STATEMENT). AVAILABLE FROM THE NATIONAL TECHNICAL INFORMATION SERVICE AS EIS-AZ-72-5-357-F1. BUREAU OF RECLAMATION, BOULDER CITY, NEVADA. (FES 72-35) SEPTEM BER 1972, 597 P. MAPS. 203 REF. Bureau of Reclamation, Boulder City, Nev. Region 3.

Descriptors: *Environmental effects, *Water conveyance, *Aqueducts, *Multiple purpose, Water utilization, *Arizona, Water resources develop-

ment, Water resources, Reservoirs, Alternate planning, Cost-benefit analysis, Aesthetics, Deserts, Environment, Maps, Canals. Identifiers: Central Arizona Project, *Lake Havasu (Ariz).

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A long-term average of 1.2 million acre-feet of water will be pumped annually from Lake Havasu for multipurpose uses. This new supply of water will be managed with local supplies to provide flexibility in meeting the demand for water imposed by municipal, industrial, and agricultural uses. Project water will be used as a replacement for ground water. The aqueduct system will be about 371 miles long and require about 16,000 acres of right-of-way supporting mostly desert shrub vegetation. The four reservoirs will require about 38,000 acres typically supporting deciduous treex near the channel and mesquite, grasses, forbs, cacti, and associated desert shrubs on the adjacent terraces. The existing biota and esthetic values will be influenced by the construction of reservoirs and the physical modification of topography and vegetation resulting from construction of project features. Some Indian lands and primitive and wilderness areas will be affected. Sections included in the statement are: description of the proposal, description of the environment, environmental impact of the C.A.P., environmental considerations included in the proposed action, adverse impacts which cannot be avoided, the relationship between short-term use of the environment and the maintenance and enhancement of long-term productivity, irreversible and irretrievable commitments of resources involved in the C.A.P., alternatives to the project, and consultation and coordination. (Paylore-Arizona)

EFFECT OF CLEAR CUTTING IN THE WATER REGIME OF THE PRINCIPAL FOREST TREES OF THE SEVAN SHORE, (IN RUSSIAN), P. A. Khurshudyan, N. A. Papikyan, and M. G. Gezalyan. Biol Zn Arm. Vol 24, No 10, p 34-37. 1971. Identifiers: "Cutting (Forests), Growth, Moisture, Poplar, Regulation, "Sevan shore, Soils, Transpiration, Trees, USSR.

Clear cutting, increasing the soil moisture in the rhizosphere, increased the rate of transpiration and growth of poplars. Clear cutting may be used to regulate to some extent the water regime of plantings, especially young ones, thus creating favorable conditions for forest growth on these areas.—Copyright 1973, Biological Abstracts, Inc. W73-13593

4B. Groundwater Management

MEASUREMENT OF GROUNDWATER FLOW USING AN IN-SITU THERMAL PROBE, New Mexico Inst. of Mining and Technology, Socorro. Dept. of Geoscience. For primary bibliographic entry see Field 02F. W73-13013

SIMULATION OF COUPLED LEAKY AQUIFERS AND SURFACE-WATER SYSTEM, New Mexico Inst. of Mining and Technology, Socorro. Dept. of Geoscience.
For primary bibliographic entry see Field 02A.
W73-13014

PUBLIC AND INDUSTRIAL WATER SUPPLIES IN NORTHERN MISSISSIPPI, Geological Survey, Jackson, Miss. For primary bibliographic entry see Field 06D. W73-13042

WATER QUANTITY MANAGEMENT AND CONTROL—Field 04

Groundwater Management—Group 4B

WATER LEVELS AND SPRING DISCHARGES FOR SELECTED WELLS AND SPRINGS IN NEVADA, 1966-69, Geological Survey, Lakewood, Colo. D. D. Gonzalez, C. T. Warren, and C. L.

Washington. Available from NTIS, Springfield, Va. 22151 as USGS-474-171 Price \$5.45 printed copy; \$1.45 microfiche. Report USGS-474-171 (NTS-248), July 1973. 69 p, 2 fig. AEC AT (29-2)-474.

Descriptors: *Groundwater resources, *Water levels, *Water wells, *Aquifers, *Nevada, Water yield, Water level fluctuations, Basic data collec-tions, Springs, Well data.

Surface-water and groundwater data were col-lected from selected wells and springs in Nevada. Data were collected for the period 1966-69 from groundwater wells, gaging stations, miscellaneous sites, and four hot spring sites. A brief description of measurement sites is given. One phase was a data collection network to evaluate possible ef-fects of nuclear explosions on the hydrology of springs and wells. Locations of gaging stations, wells, and miscellaneous spring sites are shown. (Woodard-USGS)

ANALYSIS OF SOME INORGANIC CON-STITUENTS IN WELL WATERS AND THEIR

Dental Coll. Hospital, Lucknow (India). Fluoride Study Unit.

Study Unit.
R. S. Nanda, and K. Kapoor.
Indian J Med Res. Vol 60, No 6, p 949-952. 1972.
Identifiers: Inorganic constituents, Sediments,
*Well water, Sampling, *Water analysis.

Well water samples (100) were analyzed for their contents of fluoride, phosphate, Mg, Ca, chloride and hardness for each of the 3 seasons to discover if there were differences in the concentration of these constituents in the sedimented and respecthese constituents in the securificance and respec-tive clear samples. A study of seasonal variation in sediments and clear samples was included. All these constituents were significantly greater in the sediments than in the clear samples in the summer. Fluoride, phosphate and Mg in the winter sediment samples were significantly higher. Analysis of variance applied to the data revealed significant seasonal differences for each constituent.—Copy-right 1973. Biological Abstracts, Inc. W73-13151

WATER RESOURCES OF BROWARD COUN-

TY, FLORIDA, Geological Survey, Tallahassee, Fla. For primary bibliographic entry see Field 02A. W73-13209

DETECTION OF FRESH WATER AQUIFERS IN THE GLACIAL DEPOSITS OF NORTHWESTERN MISSOURI BY GEOELEC-

TRICAL METHODS, Missouri Univ., Rolla. Geophysical Observatory. R. K. Frohlich.

Water Resources Bulletin, Vol 9, No 4, p 723-734, August 1973. 6 fig, 2 tab, 13 ref. OWRR A-046-MO (2).

Descriptors: *Geophysics, *Electrical studies, *Exploration, *Hydrogeology, Aquifer characteristics, Groundwater, Water quality, Surveys, Glacial drift, *Missouri, Conductivity, Resistivity.

Geoelectrical investigations were used to find aquifers in glacial deposits in Grundy County of northwestern Missouri. The groundwater resources of the glacial deposits have already been resumined through an extensive drilling program.
Water-bearing gravel deposits can be distinguished from glacial deposits containing appreciable amounts of clay and limited amounts of water. The

Schlumberger method used for the geoelectric depth soundings in the vicinity of the drillholes demonstrates the exploratory usefulness of the method in that it can partly replace drilling. The method also provides improved interpretation between drillholes. Clay has a resistivity below 20 between drillholes. Clay has a resistivity below 20 ohm-m, the freshwater-bearing gravel at the bottom of the buried glacial stream channels has a resistivity of 40 to 50 ohm-m, and the near surface glacial gravel deposits have a resistivity above 100 ohm-m. Interpretation of the depth soundings and the conductivity of water obtained from a local well implies that its water is drawn from the saline water of the bedrock. (Knapp-USGS) W73-13213

GEOTHERMAL ENERGY-RESOURCES, PRODUCTION, STIMULATION.
Stanford Univ., Calif. Dept. of Civil Engineering.
For primary bibliographic entry see Field 06D.
W73-13214

EXPLORATIONS FOR GEOTHERMAL.

California Univ., Riverside. Dept. of Geological Sciences; and California Univ., Riverside. Inst. of Geophysics and Planetary Physics.
For primary bibliographic entry see Field 03E.
W73-13219

STIMULATION OF GEOTHERMAL SYSTEMS, Division of Applied Technology (AEC), Washington, D.C. For primary bibliographic entry see Field 08C. W73-13225

CHEMICAL EXPLOSIVE STIMULATION OF GEOTHERMAL WELLS, Naval Weapons Center, China Lake, Calif. Research Dept. For primary bibliographic entry see Field 08H. W73-13229 CHEMICAL EXPLOSIVE STIMULATION OF

ENVIRONMENTAL ASPECTS OF NUCLEAR STIMULATION, Utah Univ., Salt Lake City. Dept. of Mechanical Engineering. For primary bibliographic entry see Field 08H. W73-13230

LITERATURE PERTAINING TO WATER QUALITY AND QUANTITY IN UNSATURATED POROUS MEDIA,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources. For primary bibliographic entry see Field 05B. W73-13302

IN SIMULATED GLACIAL CLOCCING AQUIFERS DUE TO ARTIFICIAL RECHARGE, Illinois Univ., Chicago. Dept. of Geological D. P. Ripley, and Z. A. Saleem. Water Resources Research, Vol 9, No 4, p 1047-

Descriptors: *Artificial recharge, *Injection wells, *Water quality, *Clogging, Glacial drift, Aquifers, Well filters, Recharge, Bacteria, Turbidity. Identifiers: Aquifer clogging.

1057, August 1973. 6 fig. 2 tab, 21 ref.

Clogging due to artificial recharge was tested in laboratory simulated unconsolidated aquifers. Recharge with turbid water containing an effective Recharge with unroll water containing an effective microbial inhibitor showed clogging throughout the aquifers ranging in length from 48 to 123 cm. The rate of clogging at different depths was depen-dent on the size distribution of the particles in the water relative to the pore size distribution of the porous media. Clogging tended to be more severe at the influent portion of the sample; however, when the particles in the recharge water were smaller in size or when the pore sizes of the porous smaller in size or when the pore sizes of the porous media were larger, the result was a more uniform rate of clogging with respect to depth. Recharge with nonturbid water and no effective microbial inhibitor shows clogging only in the top few centimeters. If it is not understood that these two patterns result from different causes, such a pati resulting from the combined factors could be at-tributed to only one cause, turbidity. (Knapp-USGS) W73-13374

GROUNDWATER: FROM WINDMILLS TO COMPREHENSIVE PUBLIC MANAGEMENT, Nebraska Univ., Lincoln. School of Law. For primary bibliographic entry see Field 06E. W73-13505

GROUND-WATER DISCHARGE FROM THE EDWARDS AND ASSOCIATED LIMESTONES, SAN ANTONIO AREA, TEXAS, 1972. Geological Survey, Austin, Tex.

Edwards Underground Water District Bulletin 31, July 1973. C. Puente, Compiler. 8 p, 1 tab, 12 ref.

Descriptors: *Groundwater, *Texas, *Water yield, *Discharge (Water), Aquifers, Wells, Springs, Data collections. Identifiers: Edwards Limestone (Tex), *San Antonio (Tex).

The estimated total well and spring discharge from the Edwards and associated limestones in the San Antonio area of Texas during 1972 was 747,100 acre-feet, which is the record high for the period 1934-72. The increase was due primarily to above-average springflow. The total discharge from wells and springs for 1972 was about 10% more than in 1971, and 38% greater than the average for 1934-71. About 50% of the total discharge came from wells, and approximately two-thirds of this discharge was from wells in Bexar County. Well discharge in 1972 was 10% less than in 1971, while springflow increased by about 37%. (Knapp USGS) W73-13515

A SURVEY OF THE WATER RESOURCES OF ST. THOMAS, VIRGIN ISLANDS, Geological Survey of Puerto Rico, San Juan. For primary bibliographic entry see Field 02A. W73-13516

MAP SHOWING RANGES IN PROBABLE MAX-IMUM WELL YIELD FROM WATER-BEARING GION, CALIFORNIA, Geological Survey, Menlo Park, Calif. For primary bibliographic entry see Field 07C. W73-13519 ROCKS IN THE SAN FRANCISCO BAY RE-

MAPS SHOWING AREAS IN THE SAN FRAN-CISCO BAY REGION WHERE NITRATE, BORON, AND DISSOLVED SOLIDS IN GROUND WATER MAY INFLUENCE LOCAL OR REGIONAL DEVELOPMENT, Geological Survey, Washington, D.C. For primary bibliographic entry see Field 07C. WIT 1450-0. W73-13520

WATER RESOURCES AND GEOLOGY OF MOUNT RUSHMORE NATIONAL MEMORIAL, SOUTH DAKOTA, Geological Survey, Washington, D.C. For primary bibliographic entry see Field 02F.

W73-13522

Field 04-WATER QUANTITY MANAGEMENT AND CONTROL

Group 4B-Groundwater Management

SUBSIDENCE OF THE VENICE AREA DURING THE PAST 40,000 YR, Laboratoire de Geologie Dynamique, Paris

For primary bibliographic entry see Field 02F. W73-13526

USE OF A NEUTRON MOISTURE PROBE TO USE OF A NEUTRON MOSTURE PROBE TO DETERMINE THE STORAGE COEFFICIENT OF AN UNCONFINED AQUIFER, Geological Survey, Garden City, Kans. W. R. Meyer. Geological Survey Professional Paper 450-E, p E174-176, 1962. 1 fig, 2 tab, 2 ref.

Descriptors: "Pump testing, "Storage coefficient, Unconsolidated aquifers, Theis equation, "Field capacity, Well data, "Kansas, Dewatering, Obser-vation wells.

Identifiers: *Neutron moisture probe, Unconfined aquifers, Alluvial aquifers.

Under field conditions, the storage coefficient of an unconfined aquifer was determined by using the Thiem equation and a modified form of the Theis nonequilibrium formula to analyze the draw-down data from a pumped well. These results were compared with those obtained by using a neutron moisture probe placed at various depths in the aquifer. Values for the storage coefficient as determined by the Thiem and Theis equations were 0.19 and 0.21 respectively; as determined by were 0.19 and 0.21 respectively; as determined by the moisture probe (measuring moisture content before and after drainage) the storage coefficient was 0.215. (Campbell-NWWA) W73-13554

A PERISCOPE FOR THE STUDY OF BOREHOLE WALLS, AND ITS USE IN GROUND-WATER STUDIES IN NIAGARA COUNTY, NEW YORK, Geological Survey, Washington, D.C. F. W. Trainer, and J. E. Eddy. Geological Survey Professional Paper 501-D, p D203-206, 1964. 2 fig, 3 ref.

Descriptors: *Logging (Recording), Water wells, Dolomite, Carbonate rocks, *Boreholes, Frac-tures (Geologic), Gypsum, *Groundwater availa-bility, *New York.

Identifiers: *Periscopes, *Borehole studies, Solution cavities, Temperature logs, *Permeable zones, Niagara County (NY).

A periscope made of aluminum tubing with a mirror and light at one end and a telescope at the other was used to study fractures in dolomite in shallow drill holes in western New York. Correlation of fractures observed with the periscope with inflections in temperature profiles in a well where downward flow occurs during periods of no pumping confirmed that the inflections coincide with waterbearing fractures in the rock. The periscope has also been used for examining well casings, well screens, and pump columns, and, in some places, for determining the texture and composition of the wallrock. (Campbell-NWWA)

ESTIMATING WATER QUALITY FROM ELEC-TRICAL LOGS, Geological Survey, Baton Rouge, La. A. N. Turcan, Jr. Geological Survey Professional Paper 450-C, p C135-136, 1962. 2 fig, 1 tab, 6 ref.

Descriptors: Logging (Recording), *Electrical well logging, *Resistivity, Salinity, Chlorides, Water quality, *Louisiana, Standards. Identifiers: Chloride ion concentration, *Conductance, Empirical methods, Wilcox group.

A Louisiana study has shown that it is generally possible to calibrate the readings of the electric log

in terms of water salinity for a given area. By finding the resistivity of the formation tapped and ap-plying a factor known as the field formation re-sistivity factor, which is the ratio of formation resistivity factor, which is the ratio of formation resistivity to formation water resistivity, the formation water resistivity could be calculated. Too low a value for formation water resistivity indicates salinity greater than accepted standards for fresh water. All values must be determined for each particular area. (Campbell-NWWA)

A PORTABLE SAMPLER FOR COLLECTING WATER SAMPLES FROM SPECIFIC ZONES IN UNCASED OR SCREENED WELLS,

Geological Survey, Ocala, Fla. R.N. Cherry.

Geological Survey Professional Paper 525-C, p C214-216, 1965. 1 fig, 1 tab.

Descriptors: Water wells, *Sampling, Logging (Recording), Pumps, *Water quality, Dissolved solids, *Water analysis, Groundwater, Florida. Identifiers: *Submersible pumps, *Water-bearing zones, Fracture zones, Inflatable packers.

A water sampler for use in uncased or screene wells which tap more than one water-bearing zon is described. It consists of two inflatable packers, and of a submersible pump which removes water from the section of the well isolated by the packers. Auxiliary instruments can be used to measure temperature, specific conductance, or other characteristics of the water in the isolated inouner cnaracteristics of the water in the isolated in-terval during pumping. The sampler is easily han-dled and is readily moved from one position to another and reset without removing it from the well. (Campbell-NWWA) W73-13557

GROUND-WATER CONTAMINATION AND LEGAL CONTROLS IN MICHIGAN, For primary bibliographic entry see Field 05B. W73-13562

PRELIMINARY REPORT ON THE DISPOSAL OF OIL-FIELD BRINES IN THE RITZ-CANTON OIL FIELD, MCPHERSON COUNTY, KANSAS, Bureau of Mines, Bartlesville, Okla. Petroleum Experiment Station.
For primary bibliographic entry see Field 05G.

UNDERGROUND SURVEYS WITH BOREHOLD

CAMERAS, Pennsylvania Drilling Co., Pittsburgh.

F. C. Sturges.

In: Proceedings, 12th Symposium on Exploration Drilling, University of Minnesota, School of Mining and Metallurgical Engineering, Minneapolis, Minnesota, p 39-52, 1967.

Descriptors: Logging (Recording), *Borehole cameras, Core drilling, *Geologic investigations. Identifiers: *Television cameras, Film-type cameras, Rescue operations, Mine surveys, Mine subsidence, *Stroboscopic light, *Underground

One of the developing phases of exploration - the use of borehole cameras to supplement information obtained by drilling is discussed. Ways in which these borehole cameras can supplement ond cores where rock conditions are condu cive to core losses are investigated. Types of borehole cameras, results obtained with them, and how borehole cameras, results obtained with them, and how borehole camera data have been used to solve problems on mining and civil engineering projects are shown. (Campbell-NWWA) W73-13566 DESIGN OF CASINGS AND SCREENS FOR WATER PRODUCTION AND INJECTION WELLS,
Moss (Roscoe) Co., Los Angeles, Calif.
For primary bibliographic entry see Field 08B.
W73-13568

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GROUND WATER DEVELOPMENT AND MANAGEMENT IN THE OWENS VALLEY, Department of Water and Power, Los Angeles, Calif. D. E. Williams.

Paper presented at Annual AWWA Conference, San Francisco, California, 12 p, 1970. 5 fig, 3 ref.

Descriptors: *Groundwater, Groundwater bar-riers, *California, *Groundwater recharge, *Allu-vial aquifers, Basalts, Faults (Geologic), Explo-sives, Drilling, Water wells. Identifiers: *Volcanic aquifers, Lava flows, Fault-blocks, Incrustation, *Well cleaning, Shaped-charge explosives, Blasting, *Owens Valley (Calif).

New techniques of development and management of groundwater reservoirs are currently being practiced by the City of Los Angeles in the operation of their Owens Valley ground water reservoir. These techniques include: utilization of carthquake faults as ground water dams, downhole photographic devices, well drilling using directional explosives, well cleaning using a high energy electric are and various mathematical and viscous-flow modeling techniques. (Campbell-NWWA) NWWA) W73-13569

4C. Effects on Water of Man's Non-Water Activities

ATTITUDES OF RIPARIANS TOWARDS THEIR ATTITUDES OF RIPARIANS TOWARDS THEIR
LAKE ENVIRONMENTS: A STUDY OF LAKE
WYOLA AND DAMON POND, MASSACHUSETTS,
Massachusetts Univ., Amherst. Dept. of Landscape Architecture.
For primary bibliographic entry see Field 06A.
W73-13007

THE EFFECT OF URBANIZATION ON RU-NOFF QUANTITY, Delaware Univ., Newark. Dept. of Civil Engineer-

ing. G. L. Grunkemeyer. M Sc Thesis, May 1972. 84 p, 31 fig, 12 tab, 20 ref. OWRR-A-017-DEL (1).

Descriptors: *Urban hydrology, *Urbanization, *Delaware, *Rainfall-runoff relationships, Water balance, Infiltration, Suburban areas.

Identifiers: *Red Clay Creek (Del), *Wilmington

Red Clay Creek drainage basin, Delaware, is being developed into a populated and urbanized area. Runoff from Red Clay Creek basin showed a decreasing trend during the 1944 through 1969 period of study. This decrease was cuased by an even greater decreasing trend in precipitation. The fact that runoff dropped by a lesser amount than did precipitation reflects an increasing trend in runoff. Basic land use in Red Clay Creek basin is agricultural. Ground slopes range from nearly flat to as high as 15% to 18%. Woodlands still cover over one quarter of the basin is used for pastures. Urbanization is only in the first stages. Urban development probably will increase during the next decade because of the basin's proximity to Wilmington. (Knapp-USGS)

WATER QUALITY MANAGEMENT AND PROTECTION-Field 05

Identification of Pollutants-Group 5A

ECOLOGICAL EFFECTS OF SNOWMOBILES, Carleton Univ., Ottawa (Ontario). Dept. of Biolo

P. W. Neumann, and H. G. Merriam Can Field Nat. Vol 86, No 3, p 207-212. 1972. Identifiers: *Canada (Ottawa), Ecological effects, Fox, Hare, Pine, *Snowmobiles.

Ecological impact of snowmobiles was studied in the Ottawa area, Canada. Snow structural changes by snowmobiles had significant effects on tem-perature gradients, water holding capacity and melting rate. Snowshoe hare and red fox mobility and distribution also were affected. Snowmobile and distribution asso were affected. Snowmobile damage to hardwood saplings and planted pines was significant. Browsing was unaffected except on damaged saplings.—Copyright 1973, Biological Abstracts, Inc. W73-13113

WATER POLLUTION AND ASSOCIATED EF-FECTS FROM STREET SALTING, Edison Water Quality Research Lab., N. J. For primary bibliographic entry see Field 05B. W73-13471

EFFECTS OF HIGHWAY DE-ICING SALTS ON EFFECTS OF HIGHWAY DE-ICING SALTS ON GROUNDWATER AND WATER SUPPLIES IN MASSACHUSETTS, Geological Survey, Boston, Mass. For primary bibliographic entry see Field 05B. W73-13525

4D. Watershed Protection

ENGINEERING HYDROLOGY, Oregon State Univ., Corvallis. Water Resources For primary bibliographic entry see Field 03B. W73-13016

05. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification of Pollutants

STUDIES ON THE INTERACTIONS OF BAC-TERIA AND NEMATODES,
Auburn Univ., Ala. Dept. of Botany and
Microbiology.
For primary bibliographic entry see Field 05C.
W73-13001

DATA ACQUISITION SYSTEMS IN WATER QUALITY MANAGEMENT, Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering. For primary bibliographic entry see Field 05G. W73-13024

CONTRIBUTIONS OF ALLOCHTHONOUS DETRITUS TO THE ENERGY REGIME OF DOE RUN, MEADE COUNTY, KENTUCKY, Louisville Univ., Ky. Water Resources Lab. For primary bibliographic entry see Field 05B. W73-13056

DETERMINATION OF LOW PHOSPHATE CONCENTRATIONS IN SEAWATER BY AN ISOBUTYL ACETATE EXTRACTION ROBUTYL ACETATE EATRACTION
PROCEDURE,
Osservatorio Geofisico Sperimentale, Trieste (Ita-

ly).

B. S. Cescon, and P. G. Scarazzato.

Limnology and Oceanography, Vol 18, No 3, p
499-500, May 1973. 1 tab, 3 ref.

Descriptors: *Phosphates, *Sea water, *Water analysis, *Solvent extractions, Chemical analysis, Solvents. Identifiers: Isobutyl acetate.

Isobutyl acetate is proposed as an extracting reagent for the determination of low phosphate concentrations in seawater. Because this ester is immiscible with water, its use improves both the accuracy and the ease of the method. (Knapp-USGS) W73-13037.

THE POLAROGRAPHIC DETERMINATION OF TRACE AMOUNTS OF CYANIDE, Salford Univ. (England). Dept. of Chemistry and Applied Chemistry. L. S. Bark, and B. S. Lim. Water Research, Vol 7, No 8, p 1209-1213, August 1973. 2 fig, 13 ref.

Descriptors: *Water analysis, *Poisons, *Polaro-graphic analysis, Copper, Chemical analysis, In-dustrial wastes, Pollutant identification. Identifiers: *Cyanide.

A method is proposed for the indirect determination of trace amounts of cyanide. After release and distillation of the cyanide, which is collected in 1.0 M sodium hydroxide, the cyanide is reacted with a known and excess amount of copper (II) ions. The excess of the Cu (II) ions is determined by polarography, and from the amount of Cu (II) which has reacted, the amount of cyanide originally present is calculated. (Knapp-USGS) W73-13067

ENZYMATIC NH3-N DETERMINATION: A SPECIFIC METHOD FOR THE DETERMINATION OF AMMONIA IN WATER AND SEDI-

MENTS, Hydrobiologisch Institutt, Nieuwersluis (Nether-lands).

H. Verdouw. Water Research, Vol 7, No 8, p 1129-1136, August 1973. 4 fig, 3 tab, 9 ref.

Descriptors: *Ammonia, *Nitrogen, *Chemical analysis, *Enzymes, *Water analysis, Sediments, Water quality, Organic compounds.

An enzymatic method for the determination of ammonia-nitrogen, not previously applied in water research, is described. The method is specific for NH3-N, and the risk of hydrolysis of organic nitrogen compounds is very small, because of near neutral pH and low (room) temperature condi-tions. Differences between results of enzymatic NH3-N determination and of a distillation m NH3-N determination and of a distillation method depend on the type of water. The method was adapted for application in sediment research, where the exchangeable NH3-N fraction is determined directly, without an extraction procedure. In comparison with this method, direct distillation of sediment samples gave an overestimation of the NH3-N content of 40%. (Knapp-USGS)

SLIME PRODUCTION BY PSEUDOMONAS AERUGINOSA. II. A NEW SYNTHETIC MEDIUM AND CULTURAL CONDITIONS SUITABLE FOR SLIME PRODUCTION BY PSEUDOMONAS AERGINOSA, Toho Univ., Tokyo (Japan). School of Medicine. For primary bibliographic entry see Field 05C. W73-13088

DETECTING AND MEASURING OIL ON WATER,
Delaware Univ., Newark. Coll. of Marine Studies.
V. Klemas.

Instrum Technol., Vol 19, No 9, p 54-59, 1972. Il-

lus.
Identifiers: *Oil pollution, Water pollution sources, *Pollutant identification, Measurement.

Any difference in the properties of oil and water offers a potential method for detection pollution. Successful detectors can discriminate among different oil types and are not confused by other pollutants which may resemble oil. A group of detectors which have had some success is examined from the viewpoints of the effects exploited and how much information can be delivered.—Copyright 1973, Biological Abstracts, Inc. W73-13094

YELLOWSTONE NATIONAL PARK, BASELINE WATER QUALITY SURVEY RE-

Environmental Protection Agency, Kansas City, Mo. Region VII; and Environmental Protection Agency, Denver, Colo. Region VIII. For primary bibliographic entry see Field 05B. W73-13133

A METHOD FOR THE DETECTION OF TRACES OF NITROSAMINES USING COM-BINED GAS CHROMATOGRAPHY AND MASS

BINED GAS CHROMATUGRAPHY AND MASS SPECTROMETRY, Laboratory of the Government Chemist, London (England). T. A. Gough, and K. S. Webb. Journal of Chromatography, Vol 79, p 57-63, May 16, 1973. 6 fig. 3 tab, 13 ref.

Descriptors: Water analysis, *Food, *Gas chro-matography, *Mass spectrometry, Separation techniques, Time, Laboratory equipment, *Pollu-tant identification. Identifiers: *GC-Mass spectrometry,

Nitrosamines, Pyrrolidylnitrosamine, Piperidyl-nitrosamine, Dibutylnitrosamine, Dipropyl-nitrosamine, Dietaylnitrosamine, Dimethylnitrosamine. nitrosamine, Pressure programming, Carcinogens,

A gas chromatography and high-resolution mass spectrometer, coupled via a membrane separator, were used for the analysis of samples of water and foods for traces of nitrosamines. The nitrosamines studied were dimethyl, diethyl, diprophyl, dibutyl, piperidyl, and pyrrolidyl. The nitrosamines were detected by parent ion monitoring with a detection limit of 1 mg/l on injected material. The gas chromatography incorporates a pressure programming matter of 1 mg/1 on injected material. The gas chro-matography incorporates a pressure-programming and peak-cutting device which is described in detail. Overall analysis time is substantially shorter than for isothermal or temperature-pro-grammed runs. (Little-Battelle) W73-13165

CHROMATOGRAPHIC SEPARATION PHENOLS USING AN ACRYLIC RESIN,

Ames Lab., Iowa. Ames Lab., 10 val. J. S. Fritz, and R. B. Willis. Journal of Chromatography, Vol 79, p 107-119, May 16, 1973. 15 fig, 3 tab, 18 ref.

Descriptors: *Separation techniques, *Phenols, *Resins, *Aqueous solutions, Water analysis, Sol-vents, Calibrations, Instrumentation, Laboratory

vents, Čalibrations, Instrumentation, Laboratory equipment. Identifiers: "Amberlyst XAD-7, "Liqud chromatography, Chlorophenol, Methylphenol, Bromophenol, Cresols, o-Bromophenol, p-Bromophenol, P-Bromophenol, P-Bromophenol, P-Bromophenol, P-Bromophenol, P-Bromophenol, 2 4-Dichlorophenol, 3 5-Dichlorophenol, 2 4-Dichlorophenol, 3 5-Dichlorophenol, 2 3 6-Trichlorophenol, 2 3 6-Trichlorophenol, 2 3 6-Dimethylphenol, 2 4 5-Trimethylphenol, 2 4 6-Trimethylphenol, 2 4 6-Trimethylphenol, Organic solvents, Chromatograms, Distribution coefficients.

A liquid chromatograph is described that uses gas pressure on water to force eluents through the column. A macroporous polyacrylate resin, Am-berlyst XAD-7, was used in conjunction with

Group 5A-Identification of Pollutants

methanol-water or basic aqueous eluents for separation of mixture of phenols. The elution separation of mixture of phenois. In a clution characteristics of twenty-one phenois are described. These included bromophenois, chlorophenois, cresols, and methylphenois. Several separations of actual mixtures are shown to demonstrate the separation capabilities of this system. (Little-Battelle) W73-13166

POLARIZATION: A KEY TO AN AIRBORNE OPTICAL SYSTEM FOR THE DETECTION OF OIL ON WATER, National Aeronautics and Space Administration, Moffett Field, Calif. Ames Research Center. J. P. Millard, and J. C. Arvesen. Science, Vol 180, No 4091, p 1170-1171, June 15, 1973. 2 fig, 4 ref. *Oil spills, *Aerial photography, *Remote sensing, Water pollution, *Pollutant identification, Oil pollution, Reflectance, Opical properties, On-site data collections, Cameras, Thin films, Photogrammetry.

Decriptors: *Oil spills, *Aerial photography, *Remote sensing, Water pollution, *Pollution identification, Oil pollution, Reflectance, Optical properties, On-situ data collections, Cameras, Thin films, Photogrammetry.
Identifiers: *Aerial surveillance, *Skylight polarization, *Optical systems, Polarization, Azimuths.

The detection of oil slicks can be improved by utilizing polarization techniques. Good contrast was obtained in a study of oil slicks by viewing a specific polarization component. Skylight polariza-tion, which varies with the position of the sun in the sky, influences the contrast of oil on wa Good contrast is most consistently obtained by viewing in azimuth directions toward or away e sun. Contrast is enhanced by im selected polarization components and by taking the difference between orthogonal polarization components. (Holoman-Battelle) W73-13167

SEPARATION OF NTA AND EDTA CHELATES BY THIN-LAYER CHROMATOGRAPHY, Environmental Health Directorate, Ottawa (On-

tano). F. J. M. Rajabalee, M. Potvin, and S. Laham. Journal of Chromatography, Vol 79, p 375-379, May 16, 1973. 5 tab, 10 ref.

Descriptors: *Separation techniques, *Pollutant identification, Aqueous solutions, Color reactions, Alkali metals, Heavy metals, Methodology, Ntrilotriacetic acid, Chemical analysis, Solvents, Sodium, Cadmium, Copper, Nickel, Zinc, Cobalt,

Lead, Cations.

Identifiers: "Thin layer chromatography, "Metal-EDTA chelates, "Metal-NTA chelates, Mixtures, Chromagenic reagents, Metal chelates.

The chromatographic behavior of metal-NTA che-lates on silica gel is described as well as their separation from the corresponding EDTA che-lates. The metal-EDTA and metal-NTA chelates, and metal ions were applied to silica gel thin-layer plates in aqueous solutions. The amount spotted was 0.5 microgram for the metal ions and NTA chelates, and 2 micrograms for the EDTA chelates. The spots were revealed by the praying technique and the colors observed in daylight. At high pH (solvents containing more than 1 percent of ammonia) chelate decomposition occurs and, in several cases, double fronts are observed. Only the nickel-NTA chelates were stable under these conditions. In weekly basic and neutral solvents, separation occurred and reliable R sub F values separation occurred and remade K sub r Values were obtained. These were identical for the different NTA chelates of the same metal, irrespective of the number of NTA moieties in the molecule. The TLC method is rather effective for separating mixtures of EDTA and NTA chelates. The metal cations can also be distinguished by the characteristic colors observed with the different spray reagents used. For a given divalent metal, the NTA chelate migrates faster in the same solvent than its EDTA analog, being less polar than the latter. (Holoman-Battelle)

A NEW CHROMOGENIC REAGENT FOR THE DETECTION OF PHENOLIC COMPOUNDS ON THIN-LAYER PLATES, Punjab Agricultural Univ., Ludhiana, (India). Dept. of Chemistry and Biochemistry. I. S. Bhatia, J. Singh, and K. L. Bajaj. Journal of Chromatography, Vol 79, p 350-352, May 16, 1973. 1 tab, 6 ref.

Descriptors: "Phenols, "Pollutant identification,
"Color reactions, "Methodology, Chemical analysis, Organic acids, Chemical reactions.
Identifiers: "Thin-layer plates, "Chromogenic reagents, Silica Gel G, Polyamide, Aldehydes, Bourbonal, Dihydroquercetin, Vanillia, Cyringia
cid, Syringaldehyde, Vanillia, Vanillal, Syringia
acid, Ferulic acid, Isoferulic acid, Guaiacol,
Hesperidin, Sinapic acid, Naringin, Thymol, Salicylic acid, Tyrosine, Picric acid, Gentisic acid,
Homogentisic acid, Phloroglucinal, Rutin, Caffeic
acid. Ellagic acid, Prycoatechol. Taxfolin. acid, Ellagic acid, Pyrocatechol, Taxifolin, Protocatechuic acid, Chlorogenic acid, Adrenaline, Quercetin, Tannic acid, Pyrogallol, Gallic acid, Methyl gallate.

A sensitive chromogenic reagent has been described that not only detects most of the naturally occurring phenolic compounds, but can also be used to detect specifically the ortho-dihydroxy group on both Silica Gel G and polyamide thin layers. Four micrograms of phenolic compounds dissolved in acetone were spotted onto thin-layer plates. The plates were sprayed with chromogenic reagent I which consists of sodium tungstate, TCA, HCl, and sodium nitrite solution. After 3 min, Chromogenic reagent II (NaOH solution) was sprayed on the plates. With polyamide, after using reagent I, the thin layers are dried at 30 degrees for a few minutes and then lightly sprayed with reagent II. Fifty-two phenolic compounds are listed giving the color reaction with the reagent on thin-layer plates. (Holoman-Battelle)

GEOGRAPHIC DISTRIBUTION PRESHWATER HIRUDINOIDEA IN CANADA, Calgary Univ. (Alberta). Dept. of Biology. For primary bibliographic entry see Field 05B. W73-13170

HYDROCARBONS IN THE PELAGIC SARGAS-SUM COMMUNITY,

Woods Hole Oceanographic Institution, Mass. For primary bibliographic entry see Field 05B. W73-13172

PARATHION EXPOSURE STUDIES. A GAS CHROMATOGRAPHIC METHOD FOR THE DETERMINATION OF LOW LEVELS OF P--NITROPHENOL IN HUMAN AND ANIMAL

Environmental Protection Agency, Perrine, Fla.

Perrine Primate Lab.
D. E. Bradway, and T. M. Shafik.
Bulletin of Environmental Co.

Bulletin of Environmental Contamination and Toxicology, Vol 9, No 3, p 134-139, March 1973. 3 fig, 1 tab, 7 ref.

Descriptors: *Urine, *Methodology, Chemical analysis, Organic compounds, Animal metabolism Organophosphorus pesticides, Phosphothioate pesticides, "Gas chromatography, Solvent extractions, Public health, Absorption, *Phenols. Identifiers: *Electron capture gas chromatography, *Nitrophenol, Sample preparation, Chemi-

cal recovery, Detection limits, Alkylation, Cleanup, Metabolities, Parathion, Biological sam-ples, Excretion.

A method for the determination of low levels of p-nitrophenol in rat and human urine was developed. The method involves acid hydrolysis of urine, ex-The method involves acid hydrolysis of urine, extraction with benzene, derivatization of p-nitrophenol using an electron capture detector. Recoveries of fortified rat and human urine sam-ples averaged in the range of 85-97 percent. The limits of detectability were 0.05 ppm for rat urine and 0.02 ppm for human urine. The method was applied to the analysis of p-nitrophenol in urine of rats exposed to 0.1 and 0.01 ID50 of parathion. (Holoman-Battelle) s) tu cob oth what cy A tit sper W

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GEOTHERMAL MERCURY POLLUTION IN

Department of Scientific and Industrial Research, Lower Hutt (New Zealand). Chemistry Div. For primary bibliographic entry see Field 05B. W73-13175

ELECTRON CAPTURE GAS CHROMATO-GRAPHIC ANALYSIS OF DDA: UTILIZATION OF 2-CHLOROETHANOL DERIVATIVE, Environmental Protection Agency, Perrine, Fla.

M. F. Cranmer, and M. F. Copeland. Bulletin of Environmental Contami Toxicology, Vol 9, No 3, p 186-192, March 1973. 1 fig, 3 tab, 2 ref.

Descriptors: *Chlorinated hydrocarbon pesticides, Chemical analysis, *Pollutant identification, DDT, Separation techniques, *Gas chromatography. Identifiers: *Electron capture gas chromatography, *DDA, Chemical recovery, Sample preparation, Metabolities, Derivatives, 2-Chloroethanol, Esterification, Cleanup, 2 2-Bis (polloroethanol, Esterification, Cleanup, 2 2-Bis (polloroethanol). chloropheny) acetic acid.

The use of the 2-chloroethanol derivative is reported in the electron capture gas chromato-graphic analysis of DDA (the carboxylic acid metabolite of DDT). The efficiency of conversion of DDA to the 2-chloroethanol derivative was 91.5 of DDA to the 2-chloroethanol derivative was 91.3 plus or minus 1.0 percent. The utilization of a silica gel column for clean up prior to electron capture analysis is discussed and the elution pattern for the 2-chloroethanol derivative is given with a recovery of 97.3 plus or minus 0.1 times more responsive to electron capture detection than the methyl ester of electron capture detection than the methyl ester of DDA and produces a retention time which separates the DDA from other chlorinated hydrocarbon pesticides which might interfere with the analysis. (Holoman-Battelle) W73-13176

A SENSITIVE MECHANIZED DETERMINA-A SENSITIVE MECHANIZED DETERMINA-TION OF ATP PILUS ADP, Netherlands Red Cross Blood Transfusion Ser-vice, Amsterdam. Central Lab. J. A. Loos, R. C. H. van Doorn, and D. Roos. Analytical Biochemistry, Vol 53, No 1, p 309-312, May 1973. 2 fig., 1 tab, 8 ref.

Descriptors: *Pollutant identification, Biochemistry, *Methodology, Enzymes, Filtration, Proteins, Centrifugation, Bioassay, Automation. Identifiers: *ATP, *ADP, *Enzymatic tests, Sensitivity, Sample preparation, Blood, Biological samples, Sample preservation, NADH, Lymphocytes, Lysates, Erythrocytes.

A method for the mechanized determination of ATP plus ADP using a cyclic enzymatic system which was previously described has been improved to increase the sensitivity to 6 nm. The improved system differs in the way in which the conversion of ATP into ADP is measured and is based on the consumption of NADH. In the earlier

system it was necessary to free the enzyme mix-ture by filtration. It has been found now that all the ture by filtration. It has been found now that all the commercially purified enzymes can be substituted by 'adolase paste' without changing the sensitivity or reproducibility. The new method yielded less than 5 percent difference with erythrocyte lysates when quenching of the fluorometric signal by haemoglobin was taken into account. With leukocytes, less than 10 percent difference was found. ATP added to these lysates was recovered quantitatively. This indicates that the determination is specific for ATP plus ADP in lysates of human erythrocytes and leukocytes. (Mortland-Battelle) W73-13177

POLYCHLOROBIPHENYLS IN NORTH AT-

POLYCHLOROBIPHENYLS IN NORTH AT-LANTIC OCEAN WATER, Woods Hole Oceanographic Institution, Mass. G. R. Harvey, W. G. Steinhauer, and J. M. Teal. Science, Vol 180, No 4086, p 643-644, May 11, 1973. 1 tab, 10 ref.

Descriptors: *Polychlorinated ciphenylis, *Atlan-tic Ocean, *Sea water, Surface waters, Water analysis, *Pollutant identification, Organic com-pounds, Water pollution, Solvent extractions, Chemical analysis, Separation techniques, *Gas chromatography

Chromatography.

Identifiers: *Electron capture gas chromatography, On board analysis, Sample preparation, Sargasso Sea, Detection limits.

Sargaso Sea, Detection limits.

Concentrations of polychlorobiphenyls (PCB's) have been measured at the surface and at various depths in the water of the North Atlantic Ocean between 26 degrees N and 63 degrees N. Water samples were either extracted with a hexane-ther mixture, concentrated, and analyzed by electron capture gas chromatography (ECGC) or pumped through a brass or glass column packed with Amberitie XAD-2 resin, eluted with boiling acetonitrile, diluted with distilled water or seawater, extracted with hexane, concentrated and analyzed by ECGC. All analyses were completed on shipboard within 4 hours of sampling. Unfiltered seawater samples collected and analyzed simultaneously with water filtered through a 0.3-micron glass fiber filter or a glass wool plug contained a maximum of 10 percent more PCB than the filtered seawater samples. Three observations can be made from the data: (1) Although the range is very broad, the concentrations of PCB's in the northern North Atlantic average 35 ng/kg (35 parts et rillion (ppt)) in surface waters, and 10 ppt at 200 m. (2) The PCB concentrations decrease with depth. (3) The surface waters of the Sargasso Sea (stations 25-41) have slightly lower surface concentrations of PCB's (27 ppt) than surface waters in other parts of the North Atlantic. The widespread distribution of PCB's in the open North Atlantic supports previous observations that the atmosphere must be the predominant mode of transport. (Holoman-Battelle)

A SIMPLE COULOMETRIC METHOD FOR THE DETERMINATION OF CHLORIDE IN NATURAL WATER, Oslo Univ., (Norway). Dept. of Chemistry. E. Jacobsen, and G. Tandberg. Analytica Chimica Acta, Vol 64, No 2, p 280-283, Analytica 2 dis 1 and 0 and

April 1973, 2 fig. 1 tab. 9 ref.

Descriptors: *Chlorides, *Water analysis, *Methodology, Chemical analysis, Electrolysis, Iodides, Bromides, Iron, Humus, Pollutant identification, 'Volumetric analysis. Identifiers: *Coulometry, *Natural waters, Detection limits, Ionic interference, Chemical interference, Cyanides, Thiocyanates.

A study was undertaken in order to construct a simple instrument for the coulometric titration of chloride in water. A very simple battery-operated constant-current source can be used for the titra-

tions. Experiments showed that the current remained constant during the titration at all settings (0.1-4 mA). A 1-mm silver wire was used as generating electrode. The cathode (1-mm silver wire) was isolated in a glass tube with a fine-porosity fritted-glass disc. The shield tube was filled with the supporting electrolyte used in the sample solution. The end-point was determined by applying a constant current of about 1.1 microA between two treated silver wire electrodes and recording the potential-time curve with a strip-chart recorder. (Any kind of recorder with sensitivity in the range 1-10 mV/s can be used, prositivity in the range 1-10 mV/s can be used, prochart recorder. (Any kind of recorder with sensitivity in the range 1-10 mV/s can be used, provided that it is equipped with zero suppression). The proposed method is simple and rapid and gives satisfactory results in the range of 0,1-100 micrograms of chloride per ml. The method has the advantage that the blank is not affected by colored substances like iron and humus. Of common ions bromide, iodide, thiocyanate and cyanide interfere and must be absent from the solution; these ions interfere also in the spectrophotometric method. (Holoman-Battelle) W73-13181

EXTRACTION AND GAS CHROMATO-GRAPHIC DETERMINATION OF METHYL, -ETHYL-, AND METHOXYETHYLMERCURY (IJ) HALIDES, Oak Ridge National Lab., Tenn. J. A. Ealy, W. D. Shults, and J. A. Dean. Analytica Chimica Acta, Vol 64, No 2, p 235-241, April 1973. 1 fig, 1 tab, 10 ref.

Descriptors: "Separation techniques, "Pollutant identification, "Solvent extractions, Sediments, Fish, Seeds, Chemical analysis, Plant tissues, Organic soils, Aquatic soils, Soil analysis, "Gas chromatography, "Halides."

matography, "Halides. Identifiers: Biological samples, "Organomercury compounds, "Mercury halide compounds, "Electron capture gas chromatography, Methylmercury halides, Ethylmercury halides, Methoxyethylmercury halides, Sample preparation, Chemical recovery, Reproducibility, Animal tissues, Methylmercury chloride, Ethylmercury iodide, Methylmercury choride, Ethylmercury iodide, Methylmercury horide, Rethylmercury iodide, Methylmercury bromide, Partition coefficients, Methylmercury iodide, Ethylmercury bromide, Methoxyethylmercury chloride, Mercury radioisotopes, Hg-203.

The separation, identification, and determination of methyl-, ethyl-, and methoxyethylmercury (II) halides in biological materials were studied. The procedure developed involved a 24-h leach with I M sodium iodide, equilibration of the aqueous phase for 2 min with an equal volume of benzene, and then injection of an aliquot of the benzene phase onto a gas chromatographic column consisting of 5 percent cyclohexanedimethanol succinate held on Anakrom ABS. Excellent baseline separation of the chromatographic peaks was obtained. The extraction steps were monitored with RHgX compounds tagged with Hg-203. Partition coefficients are reported for methyl- and ethylmercury (II) chlorides, bromides, and iodides; several overall formation constants of the anionic complexes RHgC1 sub n to the 1-n power (n equals 2,3) overall formation constants of the anionic com-plexes RHgCl sub in to the 1-n power (n equals 2,3) were determined. Results are reported for the recovery of methyl- and ethylmercury (II) halides from inoculated rye seed, humic and inorganic sediment, and fish grown in an aquarium. A single 24-h leach of 1-g samples gave the following D values: 12.0 plus or minus 0.2 for inorganic sedi-ment: 77 plus or minus 0.5 for coranic sediment: 5.6 plus or minus 0.2 for morganic sediment; 7.7 plus or minus 0.5 for organic sediment; 5.6 plus or minus 0.8 for fish tissue; and 9.0 plus or minus 0.5 for rye seeds. (Holoman-Battelle) W73-13182

THE NEW METHOD FOR THE DETERMINA-TION OF COBALT IN SEA WATER BY SOL-VENT EXTRACTION WITH 2-NITROSO-S-DIETHYL-AMINOPHENOL, Okayama Univ. (Japan). Faculty of Science. S. Okayama Univ. (Japan). THE NEW METHOD FOR THE DETERMINA-

Analytica Chimica Acta, Vol 64, No 2, p 217-224, April 1973, 4 fig. 4 tab, 16 ref.

Descriptors: *Cobalt, *Sea water, *Methodology, *Solvent extractions, *Pollutant identification, *Spectrophotometry, Water analysis, Chemical analysis, Heavy metals, Separation techniques, Hydrogen ion concentration, Ions, *Phenols. Identifiers: 2-Nitrous-5-diethylaminophenol, Precision, Chemical interference, Reproducibility, lonic interference, Sample preparation, Reagentian Ionic interference, Sample preparation, Reagents, Complexation, EDTA, Absorption spectra, Or-ganic solvents.

ganic solvents.

A method is described for determining cobalt in seawater spectrophotometrically by 2-nitroso-5-diethylaminophenol after extraction of the complex into 1,2-dichloroethane. This method eliminates preconcentration, requires relatively small volumes of sample solution, and provides simplicity and precision. The procedure was used in studying the effects of pH, shaking time, standing time and amounts of the reagent added on the extraction of cobalt. The optimal pH range was 4.5-8.5 for distilled water containing 0.24 microgram of cobalt, but 5.7-5.7 for sea waters. The minimal shaking time was 6 min in both cases, and a time of 10 min was selected for certainty. The standing time necessary for development of the complex was only 10 min, but a period of 30 min was considered advisable. When distilled water containing 0.24 microgram of cobalt was used, naximal absorbance was obtained with a reagent addition of 10 ml of 0.2 percent solution per liter. Those metal icen that are extracted alone with the addition of 10 ml of 0.2 percent solution per liter. Those metal ions that are extracted along with the cobalt complex can be stripped completely with HC1, thus eliminating interference. Other metal ions and anions existing commonly in seawater do not interfere. The method is applicable over the range 0-0.24 microgram Co/l when 1-1 or 2-1 samples are taken. The relative standard deviation is 4 percent for 0.15 microgram Co/1. The stability of cobalt in sea water samples is discussed. (Holoman-Battelle) W73-13183

SIMULTANEOUS DETERMINATION OF LEAD-210 AND POLONIUM-210 IN SEA

WATER, Hokkaido Univ., Hakodate (Japan). Faculty of

Fisheries. Y. Nozaki, and S. Tsunogai. Analytica Chimica Acta, Vol 64, No 2, p 209-216, April 1973. 6 fig, 2 tab, 7 ref.

Descriptors: "Sea water, "Radiochemical analysis, "Methodology, "Water analysis, Chemical analysis, "Lead radioisotopes, Radioactivity, Chemical precipitation, Heavy metals, Pollutant identificaprecipitation, H tion, Pollutants.

Identifiers: Pb-210, Po-210, *Polonium radioisotopes, Sample preparation, Alpha spectrometry, Coprecipitation, Accuracy.

A simpler and more precise method is described for the determination of lead-210 and polonium-210 in seawater. In the proposed method, these nuclides are coprecipitated with calcium carbonate and then polonium is selectively separated from other nuclides by spontaneous deposition onto a silver disc. The content of lead-210 is measured by the activity of its granddaughter, polonium-210, produced during the storage of the sample containing lead-210 for more than 3 months. In the development of this method, particular caution was taken to avoid the adsorption loss of polonium-210 onto the wall of the container used during analysis and storage. Replicate analyses done on um-210 onto the wall of the container used during analysis and storage. Replicate analyses done on about 45-1 seawater samples gave a counting error of about plus or minus 10 percent for Po-210 stored for about 5 months. Seawater samples collected from the North Pacific Ocean during the cruise of R/V Hakuho-maru, KH-71-3 in 1971 analyzed by the above procedure showed that the ratios of Po-210 to Pb-210 were smaller than unity in the surface layer of the ocean. (Holoman-Bat-stelle)

Group 5A-Identification of Pollutants

W73-13184

POTASSIUM-SELECTIVE A POTASSIUM-SELECTIVE SILECTIVE RUBBER MEMBRANE ELECTRODE BASED ON A NEUTRAL CARRIER, ON A NEUTRAL CARRIER, Technical Univ. of Budapest (Hungary). Inst. for General and Analytical Chemistry. J. Pick, K. Toth, and E. Pungor. Analytica Chimica Acta, Vol 64, No 3, p 477-480, May 1973. 2 fig, 3 tab, 19 ref.

Descriptors: *Selectivity, *Cations, Aqueous solutions, Alkali metals, *Alkaline earth metals, Potassium, Hydrogen, Sodium, Cesium, Calcium, Strontium, Magnesium.

Identifiers: *Ion selective electrodes, *Membrane electrodes, *Potassium electrodes, Ligands, Valinomycin, *Electrochemical behavior, Electromotive force, Response time, Reproducibility, Ionic interference, Barium, Lithium, Ammonium,

A new potassium-selective silicone-rubber mem-brane electrode based on the neutral carrier valinomycin has been developed. The electrode selectivity for most alkali and alkaline earth metal cations is comparable to that of the conventional liquid membrane electrodes. Over a period of 65 h no drift in e.m.f. was observed. The response time usually is less than 3 s. (holoman-Battelle) W73-13185

THE DETERMINATION OF SELENIUM IN SEA WATER BY GAS CHROMATOGRAPHY WITH ELECTRON-CAPTURE DETECTION, Okayama Univ. (Japan). Faculty of Science. Y. Shimoishi.

Analytica Chimica Acta, Vol 64, No 3, p 465-468, May 1973. 2 fig, 1 tab, 7 ref.

Descriptors: *Sea water, *Water analysis, *Methodology, *Gas chromatography, Chemical analysis, Pollutant identification, Pollutants, Solvent extractions, Separation techniques.
Identifiers: *Electron capture gas chron

raphy, *Selenium, Sample preparation, Detection limits, 4-Nitro-o-phenylenediamine hydrochloride.

A direct gas chromatographic method is described for the determination of selenium in seawater without preconcentration. A volume of seawater and HCl were combined in a separatory funnel to which was added 1 percent 4-nitro-o-phen-ylenediamine solution. This mixture was allowed to stand for 2 hr and the 5-nitropiaselenol formed was extracted into toluene by shaking for 5 min. The toluene extract was washed with 7.5 M HCl The toluene extract was washed with 7.5 M HC1 and 5-microliter aliquots were injected into a gas chromatograph equipped with an electron capture detector, and the peak height measured. Seawater samples were prepared for the procedure by membrane filtration and shaking with toluene to extract toluene-soluble material. This caused no loss in Se. Analysis of seawater samples showed an average Se content of 0.04-0.08 plus or minus 00.01 microgram/1. As even about 0.002 microgram of selenium in 1 ml of organic extract can be detected by this procedure, only 50-100 ml of seawater is needed. (Holoman-Battelle) W73-13186

CARBON-PASTE ION-SELECTIVE ION-SELECTIVE CARBON-FASTE ELEC-TRODES FOR HALIDES AND SILVER (I) IONS, Technische (Hogeschool Twente, Enschede (Netherlands), Dept. of Chemical Technology. S. Mesaric, and E. A. M. F. Dahmen. Analytica Chimica Acta, Vol 64, No 3, p 431-438, May 1973. 4 fig. 3 tab, 19 ref.

Descriptors: "Halides, "Cations, "Aqueous solu-tions, "Fabrication, Silver iodide, Measurement, Heavy metals, Halogens, Volumetric analysis, Chemical analysis, Pollutant identification, Instru-mentation, Hydrogen ion concentration.

Identifiers: *Silver, *Ion selective electrodes, *Carbon paste electrodes, Potentiometric titration, Silver chloride, Silver bromide, Potentiometry, Chemical interference, Detection limits, Silver chloride/silver sulfide electrodes, Silver bromide/silver sulfide electrodes, iodide/silver sulfide electrodes.

The behavior of a simple type of ion-selective electrode for halogens and silver has been studied. The electrode consists of a plastic body filled with carbon paste, the surface of which can be easily renewed. The paste composition is based on carbon-nujol (5:1, w/v) or carbon-paraffin wax (3:1, w/w) containing a prepared mixture of silver halide-silver sulphide (1-30 percent). The electrodes have low ohmic resistance and show a rapid Nernstain response (within 2-5 mV) for halide and silver ions down to 0.05 mM chloride, 0.01 mM bromide and 0.5 microM iodide with the respective electrodes. Ions forming very stable complexes with halide or silver and those having strong oxidizing or reducing action interfere. (Holoman-Battelle) W73-13187

THE CALIBRATION AND RESPONSE OF ION-SELECTIVE ELECTRODES AT LOW CON-CENTRATIONS OF PRIMARY IONS, Technical Univ. of Budapest (Hungary). Inst. for General and Analytical Chemistry. For primary bibliographic entry see Field 02K.

RECENT RESULTS ON THE DYNAMIC RESPONSE OF PRECIPITATE-BASED ION-SELECTIVE ELECTRODES, Technical Univ. of Budapest (Hungary). Inst. for General and Analytical Chemistry. For primary bibliographic entry see Field 02K.

W73-13189

A RUGGED SILVER-SILVER CHLORIDE ELECTRODE FOR FIELD USE, National Oceanic and Atmospheric Administra-tion, Tiburon, Calif. Marine Minerals Technology Center. For primary bibliographic entry see Field 07B. W73-13193

ERRORS OF MEASUREMENT, PRECISION, ACCURACY AND THE STATISTICAL COM-PARISON OF MEASURING INSTRUME ITS, Army Ballistic Research Labs., Aberdeen Proving Ground, Md. For primary bibliographic entry see Field 07A. W73-13194

SOME PROBLEMS ASSOCIATED WITH THE ANALYSIS OF MULTIRESPONSE DATA, Wisconsin Univ., Madison.
For primary bibliographic entry see Field 07C.
W73-13195

SOME PROCEDURES FOR ISOLATING TOXIC METABOLITES OF PHOSPHOROTHIONATE PESTICIDES FROM ANIMAL TISSUES AND

Ministry of Agriculture, Fisheries and Food, Weybridge (England). Central Veterinary Lab. A. F. Machin. edings of the Society for Analytical Chemis-

try, Vol 10, No 4, p 92-93, April 1973. 10 ref.

Descriptors: *Phosphothioate pesticides, Methodology, *Chemical analysis, *Isolation, Organophosphorus pesticides, Insecticides, Gas chromatography, Separation techniques, Pollutant identification, Mass spectrometry, Urine, Pesticide toxicity, Pollutants, *Chromatography.

Identifiers: *Metabolites, *Animal tissues, Body fluids, Thin layer chromatography, Column chromatography, High pressure liquid chromatography, Thiolates, Thermionic gas chromatography, Sensitivity, Thionates.

The chromatographic procedures used in separating the metabolites of diazinon, together with some more recent improvements, are discussed. The methods, which include thin-layer, gas, column and high-pressure liquid chromatography, are thought to be generally applicable to metabolites of phosphorothionate pesticides. Thin-layer chromatography is useful both for recognizing toxic metabolites by their inhibition of esterases and for isolating them. Gas chromatography is used extensively for detecting metabolites that contain phosphorus, determining residues and monitoring the progress of purification. A therminionic detector is generally used: its high and monitoring the progress of purification. A thermionic detector is generally used: its high and selective sensitivity probably makes it more suitable than the specific but less sensitive flame-photometric detector. Gas chromatography is convenient for isolating metabolites in microgram amounts for mass spectrometry, for which purpose an instrument designed especially for the collection of labile compounds is used. It is not satisfactory for purifying the much larger amounts needed for nuclear magnetic resonsance measurements, however, owing to the difficulty of collecting large fractions quantitatively. Column chromatography is tedious but so far has been the only way to separate dehydrodiazinon from the much matography is tedious but so far has been the only way to separate dehydrodiazinon from the much larger amounts of diazinon and fat which accom-pany it. High-pressure liquid chromatography is now being used for some of the isolations. Simple equipment, including a pump built at the author's laboratory, is used with a commercial ultraviolet detector. (Holoman-Battelle) W77.13106

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POTENTIOMETRIC STUDIES ON THIOACETAMIDE BY MEANS OF A SUL-PHIDE ION-SELECTIVE MEMBRANE ELEC-

TRODE, TON-SELECTIVE MEMBRAGE ELECTRODE, Technical Univ. of Budapest (Hungary). Inst. for General and Analytical Chemistry.
M. K. Papay, K. Toth, V. Izvekov, and E. Pungor. Analytica Chimica Acta, Vol 64, No 3, p 409-415, May 1973. 12 fig, 2 ref.

Descriptors: "Chemical analysis, "Aqueous solutions, "Pollutant identification, Inorganic compounds, "Volumetric analysis, Hydrogen ion concentration, Chemical precipitation, Methodology. Identifiers: "Thioacetamide, "Potentionmetric titration, "Ion selective electrodes, "Sulfide electrodes, Silver nitrate, Ultraviolet spectra, Infrared spectra, Membrane electrodes, Silver sulfide.

The sulphide ion-selective electrode has been found to be applicable to the determination of thioacetamide in the concentration range of 0.1-0.001 M by direct potentiometry and titration with silver nitrate. The effects of the acid and alkali content of the solutions on the titration reaction have been studied. In alkaline and slightly acidic have been studied. In alkaline and slightly acidic solutions the product of the reaction is silver sulphide; in solutions in which the acid concentration exceeds 0.5 M, a precipitate of silver thioacetamide is formed. If the alkali concentration of the solution is lower than that corresponding to the amount of acid formed during the titration, another potential jump occurs before the end-point owing to the decrease of sulphide concentration governed by hydrolysis. (Holoman-Battelle) W73-13197

ATOMIC ABSORPTION INHIBITION TITRA-TION OF ORTHOPHOSPHATE AND POLYPHOSPHATES, Wisconsin Univ., Milwaukee. Center for Great

Lakes Studies. Lakes Studies. W. E. Crawford, C. I. Lin, and C. O. Huber. Analytica Chimica Acta, Vol 64, No 3, p 387-395, May 1973. 4 fig, 4 tab, 13 ref.

WATER QUALITY MANAGEMENT AND PROTECTION—Field 05

Identification of Pollutants—Group 5A

Descriptors: "Aqueous solutions, "Water analysis, "Phosphates, Chemical analysis, "Volumetric analysis, Methodology, Anions, Surface waters, Silicates, Waste water (Pollution), Sulfates, Detegents, Pollutant identification, Water pollution. Identifiers: "Pollyphosphates, "Orthophosphates, "Atomic adsorption spectrophotometry, Total consumption burner, Premix burner, Inhibition triration, Sensitivity, Gas flow rates, Accuracy, Chemical interference, Ionic interference.

The atomic absorption inhibition titration of phosphates was studied for two types of burner. It involves titration of the anion solution with a metal cation solution while the atomic absorption signal for the metal is monitored. Magnesium was selected as the monitor metal because of its senselected as the monitor metal because of its sensitivity for measurement and the high extent of inhibition by refractory forming anions. The anions selected in this study are orthor, pyroteral and hexaphosphates. Observations were made with both total consumption and pre-mix slot burners. A hydrogen-air flame was used in order to have the relatively low flame temperatures and the flame temperature control which are necessary. The method with a pre-mix burner was used to determine phosphate in surface and waste waters. The results compared quite favorably with those by the standard method. The proposed method was found to be rapid, simple and accurate. A complete manual titration curve was obtained in less than 30 min and semi-automatic titration required less than 5 min. (Holoman-Battelle) W73-13198

THE DETERMINATION OF MOLYBDENUM IN SEA WATER BY HOT GRAPHITE ATOMIC AB-SEA WATER BY HOT GRAPHITE ATOMIC ABORPITION SPECTROMETRY AFFER CON-CENTRATION ON P-AMINOBENZYLCELL-ULOSE OR CHITOSAN, Bologna Univ. (Italy). Ciamician Chemical Inst. R. A. A. Muzzarelli, and R. Rocchetti. Analytica Chimica Acta, Vol 64, No 3, p 371-379, May 1973. 4 fig. 4 tab, 14 ref.

Descriptors: *Molybdenum, *Sea water, *Chemical analysis, *Separation techniques, *Chelation, Cations, Water analysis, Methodology, Anions, Pollutant identification, Heavy metals, Chromium, Manganese, Iron, Mercury, Lead, Nickel, Cadmium, Titanium, Cobalt, Zinc, Magnesium, Calcium, Aluminum, Phosphates. Identifiers: *Hot graphite atomizer, *Atomic aborption spectrophotometry, Preconcentration, p-Aminobenzylcellulose, Chitosan, Chemical interference, Tin, Arsenic, Silver, Diethylaminoethylcellulose, Antimony, Uranyl Dowex A.I. Dowex

cellulose, Antimony, Uranyl, Dowex A-1, Dowex 1-X8, Chelating agents.

A comparative study of the chelating ability of chitosan, p-aminobenzylcellulose and diethylaminoethylcellulose, for a number of metal ions is discussed. There is a strong interaction between molybdenum and these polymers in thiocyanate solutions and in sea water. By combining cyanate solutions and it see a water. By combining the sensitivity of graphite-furnace atomic absorption spectrometry with the efficiency of the selective collection of molybdenum on p-aminobenzyl-cellulose of chitosan at pH 2.5, it was possible to determine molybdenum in as little as 50 mg of sea water. (Holoman-Battelle)

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1968: PART II. PACIFIC SLOPE BASINS IN CALIFORNIA. Geological Survey, Washington, D.C. For primary bibliographic entry see Field 02K. W73-13200

ISOTOPHIC TRACER TECHNIQUES FOR IDENTIFICATION OF SOURCES OF NITRATE

POLLUTION, Tennessee Valley Authority, Muscle Shoals, Ala. Div. of Agricultural Development. For primary bibliographic entry see Field 05B.

W73-13201

WATER RESOURCES OF BROWARD COUN-TY, FLORIDA, Geological Survey, Tallahassee, Fla. For primary bibliographic entry see Field 02A. W73,13209

TAXONOMIC GUIDES TO ARCTIC ZOOPLANKTON (V): PELAGIC POLYCHAETES OF THE CENTRAL ARCTIC

POLYCHAETES OF THE CENTRAL ARCTIC BASIN, University of Southern California, Los Angeles. Dept. of Biological Sciences.

D. R. Yingst.
Available from the National Technical Information Service as AD-756 659, \$3.00 in paper copy, \$1.45 in microfiche. Technical Report No 1, October 1972. 49 p. 49 fig., 30 ref., 1 append. 307-270. Contract No N00014-67-A-0269-0013.

Descriptors: "Zooplankton, "Arctic Ocean, "Annelids, "Systematics, "Classification, Larvae, Arctic, Invertebrates, Animal groupings. Identifiers: "Polychaetes, "Pelagic animals, "Taxonomic guides, Animal morphology, Sample preservation, Macroinvertebrates, Antinoella spp, Macellicephala spp, Pelagobia longicirrata, Typhloscolex spp, Rhynchonerella spp, Vanadis tagensis, Phalacrophorus spp, Tomopteris spp, Travisiopsis lobifera.

A series of six practical taxonomic guides to zooplankton was prepared to meet the needs of non-taxonomists involved with Arctic fauna. The non-taxonomists involved with Alcut lating work is based upon results of research by investigators associated with the USC Arctic Project compilation associated. 1952. This compilation and its precursors since 1952. This compilation presents a detailed consideration of the different adult pelagic polychaetes found in the central Arc-tic Ocean. Emphasis has been placed on the famili-al level as information on the group is still inal level as information on the group is sun in-dequate to justify construction of generalized keys to species. Provided also are a discussion of basic polychaete morphology and terminology used in the guide, illustrations, dichotomous keys, and hints on methodology for handling preserved specimens. Selected references pertaining to and mins on methodology for handing preserves specimens. Selected references pertaining to polychaetes in general, as well as those concerning specific polychaetes in the guide, are included. (Holoman-Battelle) W73-13233

SEPARATION OF MANGANESE, IRON, COBALT, NICKEL, COPPER, ZINC AND CAD-MIUM BY REVERSED-PHASE CHROMATOG-RAPHY USING TRI-N-OCTYLAMINE AS THE STATIONARY PHASE AND APPLYING A GRADIENT ELUTION TECHNIQUE, (EXTRAK-TIONSCHROMATOGRAPHISCHE TRENNUNG VON MANGAN, EISEN, KOBALT, NICKEL, KUPFER, ZINK UND CADMIUM UNTER VER-WENDUNG VON TRI-N-OCTYLAMIN ALS STATIONARE PHASE UND GRADIENTELU-

TION),
Deutsche Akademie der Wissenschaften zu Berlin, Dresden (East Germany). Central Inst. for
Solid Matter Physics and Raw Materials Research.
B. Neef, and H. Grosse-Ruyken.
Journal of Chromatography, Vol 79, p 275-285,
May 16, 1973. 8 fig, 3 tab, 20 ref.

Descriptors: "Manganese, "Iron, "Cobalt, "Nickel, "Copper, "Zinc, "Cadmium, "Separation techniques, "Heavy metals, "Chromagraphy. Identifiers: Reversed phase chromatography, Distribution coefficients, Chromatogram

A procedure is described for the separation of manganese, iron, cobalt, nickel, copper, zinc and cadmium by means of reversed-phase chromatography. The distribution coefficients of these elements were determined by extraction with trio-octylamine-benzene (1:1) solution from hydrochloric acid-nitric acid mixtures. In addition, the influence of particle size, degree of loading of silica gel with tri-n-octylamine, flow-rate and temperature on the height of effective theoretical plate was investigated. /s gradient apparatus which was developed for this kind of separation is described; by insertion of circuitous tubes between the mixing vessels and the column head, a concentration gradient can be obtained for the eluent that is partly constant and partly decreased. (Little-Battelle) W73-13234

GAS CHROMATOGRAPHY OF TL, SE, TE, HG, AS, SB, BI, SN AS PHENYL COMPOUNDS, (GAS-CHROMATOGRAPHIE VON TL, SE, TE, HG, AS, SB, BI, SN ALS PHENYLVERBINDUN-

Tieraerztlichen Hochschule, Hanover (West Germany). Chemical Inst. G. Schwedt, and H. A. Russel.

Zeitschrift fur Analytische Chemie, Vol 264, No 4, p 301-303, May 7, 1973. 2 fig, 1 tab, 3 ref.

Descriptors: *Heavy metals, *Gas chromatography, *Methodology, *Pollutant identification, Organic compounds, Mercury, Separation techniques, Chemical analysis, Solvent extractions

Identifiers: *Organometallics, *Rare earth ele-ments, Thalluim, Selenium, Tellurium, Arsenic, Antimony, Bismuth, Tin, Mercury diphenyl, Thal-lium triphenyl, Complexation, Selenium diphenyl, Tellurium diphenyl, Arsenic triphenyl, Antimony triphenyl, Bismuth triphenyl, Tin tetraphenyl,

The phenyl compounds of thallium, selenium, tellurium, mercury, arsenic, antimony, bismuth and tin are suitable for the analysis of these elements by gas chromatography. They are produced quantitatively except thallium triphenyl when the diethyldithiocarbamates, which are extracted out detrylutinocaroanates, which are extracted out of acid solution, are reacted with magnesium organic compounds. By gas chromatography the phenyl compounds of all eight elements are separated with one column by utilizing a temperature program. In case of mercury diphenyl complete elution could not be realized. (Holoman-Potts/le) complete Battelle) W73-13235

APPARATUS FOR SEMI-CONTINUOUS CUL-TURE OF DAPHNIA,

A. M. Harvey.
Laboratory Practice, Vol 22, No 2, p 114-115,
February 1973. 1 fig, 11 ref.

Descriptors: *Daphnia, Sampling, Zooplankton, Laboratory equipment, Crustaceans. Identifiers: *Chemostat, *Culturing vessels, *Culturing techniques, Macroinvertebrates.

An apparatus for culturing Daphnia, which employs some advantage of the chemostat is described. Two-litre culture vessels with a 14 mm bottom port are used. A delicate agitator is used involving moist, sterile air bubbling through a sintered glass disc into an inverted funnel inside the culture vessel. This provides satisfactory mixing and alleviates localization of metabolic wastes and oxygen deficiency. The vessel is autoclaved at 15 nearly a serious serious sinch for 15 minutes and 15 pounds per square inch for 15 minutes, and then joined aseptically to sterile food and air lines in a joined aseptically to sterile food and air tines in a controlled temperature room at 20C. A suspension of 150,000 cells per ml of Chlorella vulgaris is pumped into the culture vessel to a volume of 1200 ml. Sterile, clonal Daphnia pulex are introduced and the agitation system activated. The culture is allowed to increase and equilibrate for six days, and the pump is switched on again to give the desired dilution rate. Although this apparatus necessarily falls short of a true chemostat in some respects of its design, it represents a much more respects of its design, it represents a much more satisfactory method than previous ones used for culturing Daphnia. The main advantages are of constancy in the environment, simplicity of con-

Group 5A—Identification of Pollutants

trol, and physiological uniformity. The methods and physiological uniformity. The methods used to minimize particular problems presented by Daphnia could easily be modified to allow the culture of other aquatic invertebrates in a similar system. (Mortland-Battelle) W73-13239

ANALYSIS OF ORGANIC CONSTITUENTS

PRESENT IN DRINKING WATER, Vysoka Skola Chemicko-Technologicka, Prague (Czechoslovakia). Dept. of Petroleum Technology and Petrochemistry.
J. Novak, J. Zluticky, V. Kubelka, and J.

Mostecky. Journal of Chromatography, Vol 76, p 45-50, February 7, 1973. 3 fig, 2 tab, 10 ref.

Descriptors: *Separation techniques, *Organic compounds, *Potable water, Gas chromatography, Mass spectrometry, Water analysis, Sol-

raphy, Mass spectrometry, Detection went extractions.

Identifiers: "GC-Mass spectometry, Detection limits, "Organic solvents, "Inert gases, "Gas bubbling, Pentene, Cyclopentane, Cyclopentane, Cyclopexane, Methylcyclopentane, Cyclopexane, Methylcyclopentane, Isobutanal, tadiene, Cyclopexane, Benzene, Trichloremethylene,
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Toluen Chloroform,

Polluted drinking water was extracted with carbon tetrachloride or nitrobenzene and the extracts were analyzed by GC-mass spectrometry. The UV and IR spectra were also recorded. A further exand its specific were also consisted of bubbling an inert gas (helium) through the water and analyzing by GC-MS. The carbon tetrachloride and nitrobenzene extracts did not reveal the presence of any organic compounds; however, when the inert gas was bubbled through the water, several organic compounds were detected. These were organic compounds were detected. I ness were Cl-C4 hydrocarbons, pentene, cyclopentane, cyclopene, and methylcyclopentane, cyclopentadiene, cyclohexane, cyclohexane, isobutanal, tetrachloromethane, benzene, trichloromethylene, chloroform, tetrachloroethylene, toluene, dichloroethane, and xylene. Although the source of the compounds was not determined, it was concluded that the limit of detection with bubbling inert gas through the sample is two to three orders higher than with extraction by organic solvents. One limitation of the method is that substances which boil above 100C cannot be determined. (Little-Rattelle)

MASS SPECTROMETRIC DETERMINATION OF DIETHYLDITHIOCARBAMATES, Colorado State Univ., Fort Collins. Dept. of

Chemistry.

Chemistry,
B. C. Wood, and R. K. Skogerboe.
Applied Spectroscopy, Vol 27, No 1, p 10-12,
January/February 1973. 2 fig, 23 ref.

Descriptors: *Heavy metals, *Mass spectrometry, Methodology, Aqueous solutions, *Pollutant identification, Chemical analysis, Cadmium, identification, Chemical analysis, Cadmium, Copper, Lead, Zinc, Solvent extractions, Chela-tion, *Carbamate pesticides. Identifiers: *Metal chelates, *Diethyldithiocarba-

mates, Direct insertion probe, Sample prepara-tion, Organic solvents, Arsenic, Reproducibility, Mass spectra, Detection limits, Accuracy.

The determination of diethyldithiocarbamate chelates of As, Cd, Cu, Pb, and Ln by direct insertion probe mass spectrometry is reported. Extractions directly into the diethylammonium diethyl-dithiocarbamate-methyl isobutyl ketone (DADDC-MIBK) solutions were carried out at the appropriate pH by the procedures outlined by Joyner and Finley (1966), Nix and Goodwin (1970), and Trujillo (1971). The extracts were stored in clean

vials from which microliter quantities were delivered to the quartz sample holder of the direct insertion probe. The measurements made on the above elements were generally reproducible to plus or minus 10 percent. Assuming an instrument blank of 1 ng, each of these elements can be deterpuans. of 1 ng, can of these elements can be determined at levels ranging from 0.5 to 1 ng via this technique. Such determination capabilities are equivalent to 0.01 ppm in a 10-ml aqueous sample extracted into 1 ml of MIBK using a 10-microliter sample of the extract for the analysis. (Holoman-Battelle)
W73-13241

MICROMETHOD SYSTEM FOR IDENTIFICA-

TION OF ANAEROBIC BACTERIA, Center for Disease Control, Atlanta, Ga. Lab. Div. S. E. Starr, F. S. Thompson, V. R. Dowell, Jr., and A. Ralows

Applied Microbiology, Vol 25, No 5, p 713-717, May 1973. 3 tab, 8 ref.

Descriptors: *Anaerobic bacteria, *Pollutant identification, *Methodology, Chemical reactions, Reduction (Chemical), Cultures, Nitrates, Nitrites, Hydrolysis, Ureas, Fermentation, Hydrogen sulfide, Carbohydrates, Laboratory tests, Speciation.

Identifiers: "Micromethod system, "Method evaluation, "Comparative tests, Culture media, Substrate utilization, Biochemical tests, Bacterial Substrate utilization, Biochemical tests, Bacterial physiology, Gas liquid chromatography, Indoles, Nutrient media, Substrates, Ehrlich reagent, Kovac reagent, Blood agars, Bacterioides spp, Clostridium spp, Fusobacterium spp, Lactobacillus catenaforme, Propionibacterium acnes, Propionibacterium granulosum, Glucose, Mannose, Mannitol, Lactose, Sucrose, Maltose, Salcin Glucoral Xvlose, Arabinose, Starch Escuicin, Glycerol, Xylose, Arabinose, Starch, Escu-lin, Gelatin, Fusobacterium necrophorum, Peptos-treptococcus, Bifidobacterium, Eubacterium lentum, Peptococcus.

A micromethod multitest system was compared with conventional tests for identification of anaerobic bacteria. The micromethod system includes tests for neutral red and nitrate reduction; H2S, urease, and indole production; hydrolysis of razs, mease, and mode production, privalysis of gelatin and esculin; and fermentation of glucose, mannose, fructose, galactose, mannitol, lactose, sucrosc, maltose, salicin, glycerol, xylose, arabinose, and starch. All procedures were conducted in an anaerobic glove box. A total of 104 cultures, including 18 reference strains and 86 diagnostic cultures, were examined. Ninety-one percent of the total tests performed with the two systems were in agreement. Greater than 90 per-cent agreement between the two systems was ob-tained with 12 of the 17 differential tests compared. The tests for nitrate reduction and H2S pared. The tests for nitrate reduction and H2S production gave the poorest agreement, 77.8 and 80.8 percent, respectively. Only 66 percent of the 86 diagnostic cultures could be presumptively identified with the micromethod system supplemented only with microscopy and colonial characteristics. However, when appropriate supplementary tests and gas-liquid chromatography were used with the micromethod system, 85 percent of the 86 strains could be identified. When Ehrlich reagent, instead of Kovac reagent, was used with the micromethod to test for indole, the agreement in identification was raised to 93 percent. (Mortland-Battelle) Battelle) W73-13242

FRITTED DISC FUNNELS AND TAPERED STAINLESS STEEL TUBES AND STOPPERS FOR USE IN PESTICIDE RESIDUE ANALYSIS, FOR USE IN PESTICIDE RESIDUE ANALYSIS, Canadian Grain Commission, Winnipeg (Manitoba). Grain Research Lab. I. Levi, and T. W. Nowicki. Bulletin of Environmental Contamination and Toxicology, Vol 9, No 1, p 20-23, January 1973. 2 Descriptors: *Pesticide residues, *Filtration, Laboratory equipment, *Filters, *Tubes, Mechanical equipment, Gas chromatography, Separation techniques, Crops, Wheat, Barley. Identifiers: Chemical interference, Sample preparation, Funnels, *Gas liquid chromatography, Biological samples, Fritted discs.

Teflon and other gaskets in blender-extractor ap-Teflon and other gaskets in blender-extractor apparatus and filter papers give rise to interfering GLC peaks during analysis of pesticide residues in wheat and barley. Two pieces of equipment were developed to avoid these problems. The first was a fritted disc funnel for filtering residue extractions. It consists of a pyrex funnel fitted with a 50 mm diameter medium porosity fritted disc which is annealed to the funnel. The funnel requires suction. The second piece of equipment is a stainless steel tapered tube and stopper assembly which requires no gaskets. Schematic drawings of the tube and stopper are included. (Little-Battelle) W73-13246

EFFECTS OF FIXATION ON THE EXTRACTION OF DIELDRIN AND P,P'-DDT FROM MUSCLE TISSUE, Massachusetts Univ., East Wareham. Lab. of Ex-

perimental Biology.

K. H. Deubert, J. S. Timmerman, and L. R.

McCloskey.

Bulletin of Environmental Contamination and Toxicology, Vol 9, No 1, p 54-56, January 1973. 1

Descriptors: *Separation techniques, *Freshwater fish, *Marine fish, *Dieldrin, *DDT, *Pesticide

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residues, Brook trout, Smelts.

Identifiers: "Sample preservation, Formalin, Biological samples, Fixation, "Muscle, Bouin's fixative, p p'DDT, Cod (Fish), Animal tissues.

Samples of muscle tissue were taken from codfish, smelt, and brook trout and fixed in formalin or Bouin's fixative to study the effect of fixation on extraction of dieldrin and p,p'-DDT. Frozen sam-ples were used for reference. The results indicate ples were used for reference. The results indicate that the use of formalin or Bouin's mixture does not affect the extractability of p,p'-DDT and dieldrin at the low levels occurring in environmental samples. As well, the results indicate that tissue samples fixed in Bouin's solution for histological studies can still be used for dieldrin and DDT analysis. (Little-Battelle) W73-13247

RESIDUES OF DDT IN COD FROM NORWEGI-

AN FJORDS, Norges Veterinarhoegskole, Oslo. Dept. of Pharmacology and Toxicology. J. E. Bierk.

Bulletin of Environmental Contamination and Toxicology, Vol 9, No 2, p 89-97, February 1973. 1 fig, 3 tab, 16 ref.

Descriptors: *Gas chromatography, *Pesticide residues, *DDT, Water pollution sources, *Lipids, Separation techniques, Runoff, DDD, DDE, Water pollution effects, Growth rates, Size, Absorption, Orchards, Path of pollutants, Water pollution effects, Marine fish. Identifiers: *Liver, *Muscle, *Cod (Fish), Biological samples, o p*DDT, p p* DDT, Gadus morhua, Sample preparation, Norway.

Samples of cod from four fiords located at the south-western coast of Norway were analyzed for DDT residues by GC. At locality A there were DDT residues by GC. At locality A there were large fruit orchards and a small forest nursery. At C there were fruit orchards, while at B there was a forest nursery only. The fourth locality, D, had no known source of contamination. At A samples were collected at intervals during the spring of 1970. The DDT content in cod liver in samples from A and C was high. The mean values of 10-15 specimens ranged between 12 and 40 ppm, calcu-

WATER QUALITY MANAGEMENT AND PROTECTION—Field 05

Identification of Pollutants-Group 5A

lated on a wet weight basis, and between 26 and 99 ppm, calculated on the basis of extractable lipids. Three specimens of cod showed residue levels of 90-135 ppm DDT in liver tissue. DDT values in cod 90-135 ppm DDT in liver tissue. DDT values in cod from the two other localities were less than 5 ppm. The specimens from A were caught at three sub-localities, and it was found that DDT levels decreased with increased distance from the head of the fiord, where the majority of fruit orchards were located. Significant correlations were found between fish size and DDT content in liver tissue, between itsis size and DDI content in liver tissue, but not in the sample from locality D. The correlations were destroyed during the spring breakup, the DDT content increasing during this period. o,p'-DDT was also found in samples taken during May and June. The high DDT levels were attributed to the runoff from fruit orchards located on steep slopes in this mountainous area. (Little-Battelle) W73-13249

FATTY ACID COMPOSITIONS OF PARACOLONS: ARIZONA, CITROBACTER, AND PROVIDENCIA, Cornell Univ. Medical Coll., New York. Dept. of Microbiology.
For primary bibliographic entry see Field 05C. For primary W73-13252

ATOMIC EMISSION SPECTROMETRY WITH AN INDUCTION-COUPLED HIGH-FREQUENCY PLASMA SOURCE. THE DETERMINA-TION OF IODINE, MERCURY, ARSENIC AND SELENIUM, Imperial Coll. of Science and Technology, London

(England). Dept. of Chemistry. G. F. Kirkbright, A. F. Ward, and T. S. West. Analytica Chimica Acta, Vol 64, No 3, p 353-362, May 1973. 4 fig. 2 tab, 14 ref.

Descriptors: *Iodine, *Mercury, *Aqueous solutions, Cations, Anions, Heavy metals, Chemical analysis, Alkali metals, Alkaline earth metals, Halogens, Cobalt, Chromium, Copper, Iron, Zinc, Molybdenum, Nickel, Phosphates, Chlorides, Manganese, Sodium, Fluorides, Nitrates, Sulfates, Aluminum, Calcium, Potassium, Magnesium, Iodides, Pollutant identification. Identifiers: *Arsenic, *Selenium, *Atomic emis-

sion spectrophotometry, High frequency plasma source, Induction-coupled plasma source, Spec-tral interference, Detection limits, Tin, Acetates,

The application is reported of an inductively coupled high-frequency plasma source to the deter-mination of arsenic, iodine, mercury and selenium in aqueous solution by atomic emission spectrometry at wavelengths less than 200 nm. In the apparatus used, only a simple indirect nebulizer d expansion chamber are used to introduce aqueous sample solutions into the plasma. Optimal conditions have been established, and the spectral interference effects at different atomic lines for each element have been investigated. With the type of instrumentation employed, the determination of iodine at 183.04 nm, mercury at 184.96 nm, arsenic at 189.0 nm and selenium at 196.09 nm is recommended to minimize spectral interferences.

No chemical or physical interferences resulting from the influence of foreign ions on the solute vaporization process have been noted. (Holoman-W73-13254

PRECISE SHIPBOARD DETERMINATION OF DISSOLVED NITROGEN, OXYGEN, ARGON, AND TOTAL INORGANIC CARBON BY GAS CHROMATOGRAPHY,

CHROMATOGRAPHY, Institution of Oceanography, La Jolla, Calif. R. F. Weiss, and H. Craig. Deep-Sea Research and Oceanographic Abstracts, Vol 20, No 4, p 291-303, April 1973. 5 fig, 25 ref.

Descriptors: *Dissolved oxygen, *Gas chromatography, *Sea water, *Chemical analysis, Water analysis, Instrumentation, Calibrations, Methodology, Pollutant identification, On-site data collections, On-site investigations, data collections, On-site investigations, 'Nitrogen, 'Carbon, 'Argon.
Identifiers: 'Shipboard measurements, Dissolved nitrogen, Dissolved carbon, Dissolved argon, On board analysis, Dissolved gases, Thermal conductivity gas chromatography, Precision, Accuracy, Winkler method.

A seagoing gas chromatographic system for the rapid and precise determination of dissolved gases in sea water is described. Separate instruments are employed for total inorganic carbon, and for employed for total inorganic carbon, and for nitrogen, oxygen, and argon analyses. Factors af-fecting the design, calibration, and shipboard operation of the system are discussed in detail. operation or time system are discussed in detail. Results of intercomparisons with other analytical techniques confirm the accuracy of the gas chromatographic method. Profiles of sigma CO2, 02, and N2 measured aboard ship are presented and discussed. (Holoman-Battelle) W73-13256

HYDROCARBONS FROM SEA WATER, Centre National de la Recherche Scientifique. Paris (France) M. Barbier, D. Joly, A. Saliot, and D. Tourres Deep-Sea Research and Oceanographic Abstr Deep-Sea Research and Oceanographic Abstracts, Vol 20, No 4, p 305-314, April 1973. 9 fig, 2 tab, 16

Descriptors: "Sea water, "Mass spectrometry, "Water analysis, Chemical analysis, "X-ray fluorescence, "Pollutant identification, Atlantic Ocean, Organic matter, "Organic compounds, Sampling, Isolation, Solvent extractions, Separation techniques, Priction. Identifiers: "Dissolved organic matter, "Gas liquid chromatography, n-Paraffins, Coastal waters, Fatty acids, Sterols, Mass spectra, Sample preparation, Chlorinated hydrocarbons, Hexachlorocyclohexane, Hexachlorodiphenyl.

Dissolved hydrocarbons have been extracted by means of chloroform, from coastal and open sea waters; after isolation of the unsaponifiable fraction and preparative thin-layer chromatography, they were analyzed by gas-liquid chromatography and mass spectrometry. Hydrocarbons represent ca 20 percent of the total extracts; concentrations may vary from 10 to 140 micrograms 1. N-Paraffine court to an extend for 12 percent for the property of the contract of the contract of the court of the contract of the court of the contract of the court of the cou fins occur to an extent of ca 12 percent, from n-C14 to n-C37, with a maximum at n-C27 to n-C30; odd carbon paraffins are not predominant. Sea waters of different origins (collected at depths of as much as 4500 metres) show a similar composition in dissolved hydrocarbons; this composition does not differ much from the hydrocarbons usually found in algae. A probable hypothesis is usuany found in algae. A procasse hypothesis is that sea-water hydrocarbons originate from the micro-or macro phytoplankton. Coastal waters clearly indicate pollution by hydrocarbons of lower molecular weight or chlorinated hydrocar-bons. (Holoman-Battelle) W73-13257

RESIDUE DETERMINATION ETHYLENETHIOUREA (2--IMIDAZOLIDINETHIONE) FROM TOMATO FOLIAGE, SOIL, AND WATER, Agricultural Research Center, Immokalee, Fla.

Journal of Agricultural and Food Chemistry, Vol 21, No 3, p 330-332, May/June 1973. 3 tab, 18 ref.

Descriptors: "Pesticide residues, "Soil contamina-tion, Water pollution, "Foliar, "Bioassay, "Pollu-tant identification, Chemical analysis, Tomatoes, Plant tissues, Urea pesticides, Water analysis, Soil analysis, Separation techniques, Carbamate pesti-cides, Thiocarbamate pesticides, Metal organic pesticides, Ditches.

Identifiers: *Ethylenethiourea, Detection limits, Thin layer chromatography, Maneb, Zineb, Dithane M-45, Sample preparation, Sensitivity, 2-midazolidinethione, Ethylenethiuram monosulfide, Ethylenediamine, Solvent extraction systems, Alternaria solani, Dithane Z-78, Dithane M-22.

A thin-layer chromatographic method was developed for the analysis of ethylenethiourea (ETU) (2-imidazolidinethione) from tomato foliage, soil, and water. High yields of ETU were obtained when heat was applied during the evaporation of dioxane-water suspensions of the fungicides ethylenethiuram monosulfide (ETM) and ethylenebisdithiocarbamate (Dithane M-45). Investigations indicate that no ETU was deserted. and ethylenebisdithiocarbamate (Dithane M-45). Investigations indicate that no ETU was detected from Dithane M-45 applications on tomato foliage, soil surface, or ditch water. The tlc method had a sensitivity of 1 ppm, which is adequate in residue analysis experiments. ETU was detected as low as 1 ppm with the tlc method, a concentration adequate in field investigations of the degradation of ethylenebisdithiocarbamate fungicide residues and their biological activity. The tlc method couled with a bioassay technique fit well into residue pled with a bioassay technique fit well into residue monitoring (RM) method of the EWDC system for more efficient timing of pesticide applications. (Holoman-Battelle)

ATOMIC FLUORESCENCE SPECTROMETRY WITH A GRAPHITE ROD ATOMIZER AND THERMOSTATED ELECTRODELESS

DISCHARGE LAMPS,
Florida Univ., Gainesville. Dept. of Chemistry.
B. M. Patel, R. D. Reeves, R. F. Browner, C. J. Molnar, and J. D. Winefordner. Applied Spectroscopy, Vol 27, No 3, p 171-176, May/June 1973. 3 fig, 4 tab, 35 ref.

Lescriptors: "Heavy metals, "Aqueous solutions, Cadmium, Copper, Mercury, Lead, Zinc, Chemical analysis, Methodology. Identifiers: "Atomic fluorescence spectroscopy, "Multielemental analysis, "Graphite rod atomizer, "Electrodeless discharge lamps, "Oil-based solutions, Detection limits, Tin, Thallium, Organometallics. Descriptors: *Heavy metals, *Aqueous solutions,

Atomic fluorescence investigations with a graphite rod atomizer and thermostated multiple element electrodeless discharge lamps (EDL's) are re-ported for Ag, Cd, Cu, Hg, Pb, Sn, Tl, and Zn. Detection limits in the range 0.1 ng to 0.01 pg have been obtained for these elements using a sample volume of 0.5 microliter. The detection limits are better than, or close to, the lowest reported values obtained by other workers using atomic spectrometric methods. No spectral or chemical interferences have been observed when using multiple element EDL's or standard multielement solutions. The atomic fluorescence signal obtained using argon and argon-hydrogen atomospheres has been studied as a function of the gas flow rates and as a function of height above the graphite rod atomizer. Except for Hg, better fluorescence signals are obtained with argon-hydrogen. (Holoman-Battelle)

THE DETERMINATION OF ALL DETECTABLE ELEMENTS IN THE AQUATIC PLANTS OF LINSLEY POND AND CEDAR LAKE (NORTH BRADFORD, CONNECTICUT) BY X-RAY EMISSION AND OPTICAL EMISSION SPEC-TROSCOPY, Pittsburgh Univ., Pa. Dept. of Biology.

Phistogia Univ., and phistogial U. M. Cowgill.

Applied Spectroscopy, Vol 17, No 1, p 5-9, January/February 1973. 7 tab, 7 ref.

Descriptors: *Aquatic plants, *Plant tissues, *Methodology, Chemical analysis, Littoral, Leaves, Root systems, Floating plants, Rooted

Group 5A—Identification of Pollutants

aquatic plants, Heavy metals, Alkali metals, Alkaline earth metals, Halogens, Pondweeds, *Connecticut, Beryllium, Mercury, Cobalt, Boron, Sodium, Molybdenum, Cadmium, Sampling, Potassium, Manganese, Calcium, Aluminum, Chlorine, Sulfur, Magnesium, Phosphorus, Iron, Titanium, Zinc, Copper, Strontium, Nickel, Cesium, Chromium, Lead, Iodine, Bromine, Fluorine, Submerged plants, Pollutant identification. Identifiers: *X-ray emission spectroscopy, *Optical emission spectroscopy, *Chemical composition, Macrophtes, Rare earth elements, Linsley Pond, Clear Lake, Sample preparation, Stems, Blossoms, Hornworts, Bismuth, Tin, Vanadium, Silver, Lithium, Silicon, Nymphaea odorata, Scented pond illy, Nuphar advena, Yellow water illy, Ceratophyllum demersum, Potamogenton praelongus, Pontedaria cordata, Pickerelweeds, Decodon verticillatum, Swamp loosestrife, Scandium, Cerium, Lanthanum, Yttrium, Arsenic, Praseodymium, Neodymium, Gadolinium, Dysprosium, Erbium, Ytterbium, Thorium, Niobium, Samarium, Germanium, Barium, Hafnium, Zirconium.

A method, employing optical and x-ray emission, is described for the determination of all detectable elements in aquatic plants growing in the littoral zone of two lakes in Connecticut. The pondweed and the horawort accumulate As. Comparative data are presented for the determination of this element by atomic absorption and x-ray emission. The chemical composition of some plants is shown as well as the distribution of the rare earths in various portions of the vellow water little. (Holomanous portions of the yellow water lily. (Holor Battelle) W73-13261

COLIFORMS, FECAL COLIFORMS, AND FECAL STREPTOCOCCI AS INDICATORS OF WATER POLLUTION, Hadassah Medical School, Jerusalem (Israel).

For primary bibliographic entry see Field 05B. W73-13262

GAS-LIQUID CHROMATOGRAPHIC SEPARA-TION OF SULFUR FROM CHLORINATED PESTICIDE RESIDUES IN WASTEWATER

Los Angeles County Sanitation Districts, Whittier.

R. B. Baird, L. G. Carmona, and C. L. Kuo. Bulletin of Environmental Contamination and Toxicology, Vol 9, No 2, p 108-115, February 1973. 4 fig, 8 ref.

Descriptors: "Water analysis, Waste water (Pollu-tion), "Sediments, "Sulfur compounds, "Separa-tion techniques, "Chlorinated hydrocarbon pesti-cides, DDT, DDD, Endrin, Dieldrin, DDE, Aldrin, Heptachlor, Sulfur, Insecticides,

residues. Identifiers: Chemical interference, "Gas liquid chromatography, "Column packing, Heptachlor epoxide, Lindane, BHC, Columns, Column cleanup, p p'DDT, p p'DDD, o p'DDT, o p'DDD, p p'DDE, o p'DDE,

Sulfur interference in the GC analysis of chlorinated pesticides was eliminated by the addition of 1.0 percent DC-200 to the column packing cition of 1.0 percent DC-200 to the column packing of 4.4 percent OV-17 and 4.7 percent QF-1 on 80/100 mesh Gas-Chrom Q solid support. Samples of 13 chlorinated pesticides were analyzed with the column. The effect of the DC-200 addition was to shift the major interfering sulfur peak between those of o,p-DDE and p'p-DDE, thus eliminating the sulfur interference with the analysis of these compounds without diminishing the resolution of the remaining pesticides of interest. Routine use of this mixed column demonstrated that satisfactory analysis of sulfur-containing wastewaters and sediments may be performed without lengthy chemical desulfurization or extraction of large quantities of sample followed by detection with a highly selective detector. (Little-Battelle) W73-13263

DISTRIBUTION AND BACKGROUND LEVELS OF MERCURY IN SEDIMENT CORES FROM SELECTED WISCONSIN LAKES, Wisconsin Univ., Madison. Dept. of Soil Science. For primary bibliographic entry see Field 05B. W73-13264

ENZYME ELECTRODES, Utah Univ., Salt Lake City. Coll. of Engineering. D. A. Gough, and J. D. Andrade. Science, Vol 180, No 4084, p 380-384, April 27,

*Monitoring, *Methodology, *Pollutant identifica-tion, Chemical reactions, Properties, Elec-trochemistry, Enzymes, Amino acids, Ureas, Laboratory equipment, Research equipment, Reviews, Polarographic analysis, Pollutants, Or-

Reviews, Polarographic analysis, Pollutants, Organic compounds.
Identifiers: "Metabolites, "Potentiometry, "Immobilized enzyme electrodes, "Electrochemical behavior, Glucose, Response time, Enzyme electrodes, Enzyme immobilization, pH electrodes, PCO2 electrodes, Oxidases, Urease, beta-Glucosidase, Catalase.

The development of biochemical-specific electrode system is discussed; some of the foreseeable problems that might be associated with their use are presented; and the essential literature is reviewed. It was determined that the clinical determinations of certain metabolites and soluble enzymes by means of enzyme electrodes are quite feasible. Such devices may be made highly specific by the use of appropriate enzymes and a high degree of accuracy can be obtained. Instantaneous and continuous determinations can be made from physiological fluids, and undesirable made from physiological fluids, and undesirable physiologic responses can theoretically be minimized, thus making long-term clinical moni-toring a possibility. Enzyme electrodes may also have a useful lifetime and meet other practical requirements. (Holoman-Battelle)

KINETIC MICRODETERMINATION OF MER-CURY IN NATURAL WATERS AND BIOLOGI-

CAL MATERIALS, Windsor Univ. (Ontario). Dept. of Chemistry. P. J. Ke, and R. J. Thibert. Mikrochimica Acta, No 3, p 417-427, 1973. 2 fig, 4 tab. 39 ref.

Descriptors: "Mercury, "Methodology, Chemical analysis, "Water analysis, Heavy metals, Urine, Chemical reactions, Chelation, Freshwater, Sea water, Rivers, Lakes. Identifiers: "Biological samples, "Trace levels, Ion exchange resins, Detection limits, Blood serum, Errors, Organomercury compounds, Organometallics, Body fluids, Natural waters, Sample preparation.

A wet digestion has been developed to prepare water and biological samples for a kinetic determination of mercury using an iodide-catalyzed reaction between cerium (IV) and arsenite (III). A mercury-free control, prepared using ion-exchange with a selective chelating resin, was used by adding mercury standards to make a calibration curve. Both inorganic and organic mercury can be determined by the method described cury can be determined by the method described either in water or biological samples containing mercury in the range of 0.05 to 2.0 micrograms per ml. The procedure can be used satisfactorily down ml. The procedure can be used satisfactorily down to the 0.005-ppm level for fresh water and urine with an overall error of less than 5 percent. The method can also be employed for the determina-tion of mercury in sea water or blood serum with an error of 10 percent or less and gives results which compare favorably with other procedures. (Holoman-Battelle) W73-13271

CHLORINATED HYDROCARBONS IN PLANK-TON FROM THE GULF OF MEXICO AND NORTHERN CARIBBEAN,
Texas A and M Univ., College Station, Dept. of

For primary bibliographic entry see Field 05B. W73-13273

DISTORTION OF MIREX RESIDUES IN IN-SECTS OWING TO USE OF ISOPROPYL AL-COHOL AS A COLLECTION SOLVENT, Agricultural Research Service, Gainesville, Fla. Insects Affecting Man and Animals Research Lab. D. A. Carlson, W. A. Banks, and D. P. Wojcik. Bulletin of Environmental Contamination and Toxicology, Vol 9, No 6, p 365-369, June 1973. 3 tab, 3 ref.

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Descriptors: "Pesticide residues, "Pollutant identification, "Insects, Chlorinated hydrocarbon pesticides, Chemical analysis, Storage, Insecticides, Solvent extractions, Separation techniques. *Pollutant clues, solvent extractions, separation termiques. Identifiers: "Mirex, "Isopropyl alcohol, Sample preservation, "Sample preparation, Organic solvents, Solenopsis invicta, Blattella germanica, Electron capture gas chromatography.

Collection or storage of insects in 70 percent isopropyl alcohol (IPA) was found to cause loss of body weight, major loss of nonpolar insecticides from submerged specimens, and transfer of insecticide to previously uncontaminated specimens. These effects may by no means be limited to mirex, since any chlorinated hydrocarbon is relatively lipophilic and may behave similarly. Residues reported for treated insects that have been collected or stored in alcohol may have been reduced to 12 percent of the original value. Moreover, small untreated vertebrates and invertebrates trapped in alcohol with insecticide-laden insects are likely to absorb significant amounts of insecticide from the solution. (Holoman-Battelle) W73-13274 W73-13274

ATOMIC ABSORPTION SPECTROMETRY OF TRACES OF TRI- AND HEXAVALENT TRACES OF CHROMIUM.

Nagoya Univ. (Japan). Dept. of Synthetic Chemis-

try. M. Yanagisawa, M. Suzuki, and T. Takeuchi. Mikrochimica Acta, No 3, p 475-480, 1973. 3 fig, 1

Descriptors: "Pollutant identification, "Chemical analysis, Methodology, "Aqueous solutions, "Chromium, Hydrogen ion concentration, Solvent extractions, Chelation, Heavy metals, Pollutants,

Cations.
Identifiers: *Trace levels, *Atomic absorption sectrophotometry, Metal chelates, Reproducibility, Sodium diethyldithiocarbamate, 8-Hydroxyquinoline, Thenoyltrifluoracetone.

Atomic absorption spectrometry combined with extraction has been shown to be a rapid and precise method (reproducibility of plus or minus 1 to approximately 2 percent for 5 determinations) for the determination of traces of tri- and hexfor the determination of traces of tri- and hexavalent chromium. The chromium diethyldithiocarbamate chelate was used for chromium
(VI), whereas hydroxyquinolate or thenoyitrifluoracetonate chelate for chromium (III). A series of solutions in the range of pH 2 to approximately 8 was prepared and investigated to confirm
the optimum pH range for extraction of chromium
chelates. The optimum pH range for quantitative
extraction of chromium chelates is 5 to approximately 7. Two extractions were necessary for
complete extraction of the chromium hydroxyquinolate. Acetate buffer was suitable for the exraction of the chromium chelate, in contrast to
poor extraction results in a phosphate buffer. Fe,
Cu, Al, Y, and Mo did not interfere with Cr absorption. The optimum flame conditions were:
flow rate of air, 6 1/min; flow rate of acetylene, 2
1/min; beam height, 10 mm above burner top.
(Holoman-Battelle)

WATER QUALITY MANAGEMENT AND PROTECTION-Field 05

Identification of Pollutants—Group 5A

W73-13275

APPLICATION OF A SULFATE-SENSITIVE ELECTRODE TO NATURAL WATERS, Texas Instruments, Inc., Dallas, R. Jasinski, and I. Trachtenberg. Analytical Chemistry, Vol 45, No 7, p 1277-1279, June 1973. 3 tab, 6 ref.

Descriptors: *Sulfates, *Sea water, *Waste water (Pollution), *Brackish water, Potassium, Chlorides, Magnesium, Volumetric analysis, Elec-trodes, Water analysis, Calcium.

Identifiers: *Ion selective electrodes, *Chemical inteference, Chalcogenide glass electrode.

Iron-doped chalcogenide glass electrodes were used to investigate potential interferences during analysis of sulfate ions in natural waters of high sulfate content. The method was based on barium sulfate precipitation. Test solutions were prepared in which Ca, K, and Mg were added as interfering ions. Samples of waste water, brackish water, and sea water were also analyzed. A Ag/AgCl elecsea water were also analyzed. A Ag/AgCI elec-trode was used as reference in the analyses. The resulting difficulties introduced by the ions con-sidered were essentially the same as in all barium sulfate methods. Sodium ion and chloride ion at a hundredfold excess caused no problems. Potassium ion interfered at this concentration level via coprecipitation; 94 percent recovery was obtained for 0.02 m sulfate ion in 0.1 M KCl. Magnesium and calcium distort the end point because of simultaneous complexation with sulfate ion; this does not cause a major problem with the titration technique. Although calcium also coprecipitates, this effect is sufficiently reproducible to allow for correction if the Ca content is known. At high sulfate concentrations the sample can be diluted to minimize interference. (Little-Battelle)

IRON SPECTRAL INTERFERENCE IN THE DETERMINATION OF ZINC BY ATOMIC AB-SORPTION SPECTROMETRY, Arizona State Univ., Tempe. Center for Meteorite

Nu. R. Kelly, and C. B. Moore. Analytical Chemistry, Vol 45, No 7, p 1274-1275, June 1973. 1 fig, 2 tab, 12 ref.

Descriptors: *Zinc, *Aqueous solutions, Iron, Heavy metals.

Identifiers: *Chemical interference, *Atomic absorption spectrophotometry, Errors, Accuracy.

Aqueous solutions were prepared for atomic absorption spectrometry by dissolving iron spong in HCI, drying, and dissolving in distilled water. These solutions were used to demonstrate that iron solutions, completely free of zinc, absorbed at the zinc resonance line. Iron was extracted from samples of the solution for analysis of zinc. Absorption curves showed that the determination of low levels taken to remove iron from the samples prior to analysis. Solutions which contain between 0.2 to 2.0 percent iron will be erroneously high by 16 and 13 micrograms/g Zn, respectively. It is suggested that existing analyses of zinc on ferrous materials should be approached with caution. (Little-Battelle) tle-Battelle) W73-13277

CHELOMETRIC TITRATIONS OF METAL CA-TIONS USING THE TUNGSTEN BRONZE ELECTRODE,

Ames Lab. Iowa M. A. Wechter, P. B. Hahn, G. M. Ebert, P. R.

Montoya, and A. F. Voigt. Analytical Chemistry, Vol 45, No 7, p 1267-1269, June 1973. 3 fig, 1 tab, 6 ref.

Descriptors: *Volumetric analysis, Aluminum, Zinc, Copper, Iron, Calcium, Magnesium, Heavy metals, Aqueous solutions, Electrodes, *Alkaline earth metals, *Metals, *Cations.

Identifiers: *Tungsten bronze electrodes, *Ion selective electrodes, Sample preparation, Chemi-

Tungsten bronze electrodes were used with saturated calomel electrodes in the potentiometric titration of solutions of Al (III), Zn (II), Cu (II), Fe (III), Ca (II), and Mg (II). Solutions were prepared by dissolving Al, Zn, and Cu in HN03 and diluting by dissolving AI, Zn, and Cu in HNOs and ciliumg and by dissolving salts of the remaining elements. Solutions were buffered with NH3/NH4C1 or NH4N03 and titrated with EDTA. There was excellent agreement between calculated and observed values. Oxygen in the solutions did not interfer in the titration. terfere in the titrations. In order to perform a suc-cessful metal ion titration, only one of the follow-ing criteria need be met: the metal ion be titrable in ing criteria need be met: the metal ion be utrable in basic solution either directly or indirectly, the ion be easily reducible directly at the electrode sur-face, or a metal redox couple be present which un-dergoes a change in concentration ratio at the end point. (Little-Battelle) W73-13278

DETERMINATION OF TRACES OF THALLIUM IN URINE BY ANODIC STRIPPING AC VOL-

TAMMETRY,
Universidad Nacional de Rosario (Argentina).
Faculty of Biochemical Sciences.

D. I. Levit.
Analytical Chemistry, Vol 45, No 7, p 1291-1292,
June 1973. 1 fig, 1 tab, 10 ref.

Descriptors: *Urine, Lead, Dissolved oxygen. Identifiers: *Thallium, *Chemical interference, *Anodic stripping voltammetry, Sample prepara-tion, Albumin, Reproducibility.

The purpose was to apply the ac anodic stripping voltammetry technique with the hanging mercury drop electrode (HMDE) in a body fluid urine in drop electrode (HMDE) in a body fluid urine in order to determine, rapidly and directly, traces of thallium by measuring the current peak which results from the fundamental hermonic as stripping voltammogram record. The behavior of thallium was examined, and the presence of interferences such as lead, dissolved oxygen, organic compounds, and other complications that effect the electrode process by adsorption were minimized under the selected conditions of experimentation. The sensitivity of the method was immentation. The sensitivity of the method was improved by a low background current and was reproducible within 2.5 percent for 0.05 ppm thallimin urine. The Tl (I) wave had a symmetrical shape, and its ac peak was a linear function of the concentration in the micromolar range without interference from overlapping waves. Pre-treatment by dilution, cell exchange, use of complexing agents, degasification, and foaming were not required. (Little-Battelle) W73-13279

DETERMINATION OF NITROGEN-15 BY

DETERMINATION OF NITROGEN-15 BY CHEMICAL IONIZATION MASS SPECTROMETRY, Rockefeller Univ., New York.
C. V. Lundeen, A. S. Viscomi, and F. H. Field.
Analytical Chemistry, Vol 45, No 7, p 1288-1290, June 1973. 1 fig, 2 tab, 8 ref.

Descriptors: *Mass spectrometry, *Nitrogen, Digestion, Radioisotopes, Ammonia. Identifiers: *Sample preparation, *N-15, Biological samples, N-14, Acid digestion, *Chemical ionization mass spectrometry.

A technique is presented for determining N-15 using isobutane chemical ionization mass spectrometry. The method is based on the fact that amtrometry. The method is based on the fact that am-monia is easily protonated by the tert-butyl ion in isobutane chemical ionization mass spectrometry to produce the NH4 (plus) ion, but water is not protonated to produce the H30 (plus) ion. Con-sequently, the relative amounts of N-15 and N-14 in ammonia containing both of these isotopes are obtained from the intensities of the m/e 18 and 19 ions produced where ammonia is introduced into the mass spectrometer. The ammonia to be mea-sured is produced from the original nitrogenous material by acid digestion and is absorbed on solid stearic acid. The stearic acid is placed in the solids introduction probe and heated to release the am-monia. (Little-Battelle) W73-13280

CHROMATOGRAPHY OF 48 METAL IONS ON STANNIC ARSENATE AND PLAIN PAPERS IN BUTANOL-NITRIC ACID MEDIA,
Z. H. Coll. of Engineering and Technology,

Z. H. Coll. of Englishering Adigarh (India). M. Qureshi, and S. D. Sharma. Analytical Chemistry, Vol 45, No 7, p 1283-1288, June 1973. 5 fig, 5 tab, 10 ref.

Descriptors: "Metals, "Separation techniques, "Ion exchange, Lead, Potassium, Copper, Calcium, Zinc, Manganese, Cobalt, Nickel, Mercury, Cadmium, Beryllium, Magnesium, Iron, Aluminum, Chromium, Ceium, Gold, Titanium, Molybdenum, Ions, Strontium. Identifiers: "Paper chromatography, Silver, Rubidium, Cerium, Palladium, Barium, Samarium, Praseodymium, Nedymium, Indium, Gallium, Lanthanum, Yttrium, Bismuth, Antimony, Ruthenium, Iridium, Thorium, Hafaium, Columbium, Tungsten, Platinum, Thallium, Organic solvents, Uranyl, Vanadyl.

The chromatography of 48 metal ions was systematically studied in butanol-HNO3 systems on plain and ion exchange papers. Solutions were prepared of K, Rb, Cs, Cu, Ca, Pd, Zn, Ma, Co, Ni, Hg, Cd, Ba, Sr, Be, Mg, Pb, Uo2, Fe (III), VO, Sm, Pr, Nd, Fe (III), In, Ga, La, Y, Al, Cr, Ce (III), Bi, Sb, Au, Ru, Ir, Th, Hf, Ti, Ce (IV), Cb, MG, W, Pt, Ag, and Ti and spotted op the parents. Mo, W, Pt, Ag, and T1 and spotted on the papers. Separations are given on the basis of R sub F values. In addition, the Ksub sp of the arsenates of K, Rb, Cs, Tl, Y, La, Ga, and Ce were predicted on the basis of the R sub F values. (Little-Battelle) W73-1328

GAS CHROMATOGRAPHIC DETERMINATION OF RESIDUES OF METHYLCARBAMATE IN-SECTICIDES IN CROPS AS THEIR 2,4-DINITROPHENYL ETHER DERIVATIVES, Agricultural Research Service, Beltsville, Md

Dournal of the Association of Official Analytical Chemists, Vol 56, No 3, p 713-717, May 1973. 5 fig, 3 tab, 3 ref.

Descriptors: "Separation techniques, "Gas chromatography, "Plant tissues, Pesticide residues, Crops, Carbamate pesticides, Asparagus, Carrots, Lettuce, Tomatoes.

Identifiers: "Sample preparation, "Detection limits, "Methylcarbamate pesticides, Aminocarb, Bay 32651, Bay 78537, Bux, Carbanolate, Carbaryl, Carbofuran, Ciba C-9643, Decarbofuran, Hercules 5727, Hercules 9007, Landrin, Mesurol, Mexacarbate, Mobam, Promecarb, Propoxur, Biological samples, Kale, Chromatograms, Cucumbers, Eggplant, Green beans, Spinach, Squash, Organic solvents, Recovery.

A general procedure was developed for determining methylcarbamates in plant materials. The pesticides investigated were Aminocarb, Bay 2651, Bay 78537, Bux, Carbanolate, Carbaryl, Carbofuran, Ciba Cl9643, Decarbofuran, Hercules 5727, Hercules 9007, Landrin, Mesurol, Mexacarbate, Mobam, Promecarb, and Propoxur. The residue was extracted from crop material with actonitritle, and the extractive purified by partitioning with petroleum ether and coagulating with phosphoric acid-ammonium chloride solution. Phenolic impurities were largely eliminated by partitioning a methylene chloride extract with 0.1 N potassium hydroxide. Carbamate residues were then treated with 1-fluoro-2,4-dinitrobenzene to

Group 5A-Identification of Pollutants

form the ether derivative without a prior hydrolysis step. Efficiency in the conversion of the phenolic moieties to the phenyl ethers was essentially 100 percent, thus providing for good reproducibility. Residues were determined at levels as low as 0.05 ppm. Recoveries generally ranged between 90 and 110 percent. (Little-Battelle) W73-13282

COLLABORATIVE STUDY OF THE NONAQUEOUS COPPER COLORIMETRIC AND SILVER TITRIMETRIC METHODS FOR THE DETERMINATION OF MALATHION IN TECHNICAL GRADE MALATHION AND IN AMERICAN FORMULATION, American Cyanamid Co., Princetop M. I.

R. S. Wavne

Journal of the Association of Official Analytical Chemists, Vol 56, No 3, p 579-585, May 1973. 4 fig, 7 tab, 8 ref.

Descriptors: *Methodology, *Chemical analysis, Reliability, Volumetric analysis, Gas chrom

raphy, Testing procedures, Evaluation.
Identifiers: *Collaborative studies, *Method evaluation, *Comparative tests, Standard methods, Coefficient of variation, Interlaboratory tests, *Malathion, Gas liquid chromatography, Copper colorimetry, Silver titrimetry.

The nonaqueous copper colorimetric and the silver titrimetric methods for the determination of malathion were studied collaboratively. The study involved wettable powders, emulsifiable concen-trates, dusts, and the technical grade product. The mean of all of the results indicates that both procedures will give comparable values for each ple type used in the study. Agreement between replicates in individual laboratories was excellent. Agreement between laboratories was satisfactory; coefficients of variation ranged from 1.3 to 4.8 per-cent for the sample studied. The 2 methods offer improved reliability and ease of operation when compared to the official first action colorimetric method, 6.265-6.269. The methods have been adopted as official first action. (Mortland-Battelle) W73-13283

AN ISOLATION AND CLEANUP PROCEDURE FOR LOW LEVELS OF ORGANOCHLORINE PESTICIDE RESIDUES IN FATS AND OILS, Food and Drug Administration, Washington, D.C.

Div. of Chemistry and Physics.
M.L. Porter, and J. A. Burke.
Journal of the Association of Official Analytical Chemists, Vol 56, No 3, p 733-738, May 1973. 3 fig, 3 tab, 9 ref.

Descriptors: "Oil, "Chlorinated hydrocarbon pesticides, "Lipids, "Polychlorinated biphenyls, DDE, DDD, DDT, Dieldrin, Aroclors, Separation techniques, "Pesticide residues.

Identifiers: "Cleanup, Lindane, Mirex, Heptachlor epoxide, Endosulfan I, Endosulfan II, Endosulfan sulfate, Aroclor 1254, Vegetable oil, Fish oil Asimolals Pacayary, Patestro limits, Chro-

oil, Animal oils, Recovery, Detection limits, Chromatograms.

An isolation and cleanup is described for low levels of organochlorine residues (about 0.005 ieveis of organochiorine residues (unout 0.003 pm) in fats and oils, prior to electron capture gasliquid chromatography, Corn oil, butterfat, cold liver oil, chicken fat, and several dietary composites were used in the analyses for lindane, DDE, TDE, DDT, Mirex, heptachlor epoxide, endosulfan I and III, dieldrin, endosulfan sulfate, and Aroclor 1254. The fat or oil was distributed on a column of unactivated Floriisil and the resid partitioned into an eluant of 10 percent water in acetonitrile. Florisil column chromatography with elution solvent system comprised of mixtures of methylene choride, acetonitrile, and hexane was used for the final cleanup. Extracts prepared in this manner were sufficiently free of fatty extractives to permit injection of the equivalent of 50-60 mg fat sample for GLC. The procedure should be especially useful in determination of low levels of organochlorine pesticide residues in the fat of certain dietary composites. (Little-Battelle) W73-13284

COMPARATIVE EXTRACTION OF CHLORINATED HYDROCARBON INSECTI-CIDES FROM SOILS 20 YEARS AFTER TREAT-

MENT,
Agricultural Research Service, Beltsville, Md.
Agricultural Environmental Quality Inst.
For primary bibliographic entry see Field 05B.

MERCURY CONTAMINATION OF FISH IN NORTHWESTERN ONTARIO, Acres (H. G.) and Co. Ltd., Niagara Falls (Ontario).

rimary bibliographic entry see Field 05C. For primar W73-13287

MICRO AND SEMIMICRO DETERMINATION OF THIOLS WITH ION-SELECTIVE ELEC-

TRODES,
California Univ., Livermore. Lawrence Livermore Lab.

W. Selig. Mikrochimica Acta, No 3, p 453-466, 1973. 3 fig, 4 tab. 21 ref.

Descriptors: *Sulfur compounds, *Pollutant identification, *Methodology, Electrochemistry, Chemical analysis, Volumetric analysis, Organic compounds, Solubility, Solvents.

Identifiers: *Ion selective electrodes, *Trace levels, *Thios, *Potentiometric titration, levels, *Thios, *Potentiometric titration, *Add a phetrodes, Sulfide elec-

levels, "Thiols, "Potentiometric titration, Reproducibility, Iodide electrodes, Sulfide elec-trodes, Chloride electrodes, Copper electrodes, Lead electrodes, Bromide electrodes, Mercuric perchlorate, Chemical recovery, "Mercaptans, Quinolinethiol, Toluenethiol, Thiosalicylic acid, Thiomalide, acid, Dodecanethiol, Thionalide, Mer-captoacetic acid, Potassium salts, Glutathione, Sedium est.

Described is the potentiometric determination of a variety of thiols. Microamounts (0.01 to 0.1 mM) are titrated with 0.01 N mercuric perchlorate while semimicroamounts (0.1 to 0.5 mM) are titrated with 0.05 N mercuric perchlorate. A bromide selective indicator electrode and a single-junction reference electrode are used with an expanded-scale pH meter to monitor the emf. Other indicator scale pri meter to monitor the emi. Outer indicator electrodes based on a silver sulfide matrix may also be used. The preferred solvent is acetone while ethanol and p-dioxane have limited applicability. The electrode response is slower in general than for other titrations using ion-selective electrode response in the property of the trodes, particularly for the more complex thiols and those attached to a heterocyclic ring system. (Holoman-Battelle)

CHEMICAL COMPOSITION OF OCEAN USING A DIRECT MEASURING OCEANOGRAPHIC A DIRECT MEASURING OCEANOGRAPHIC ELECTROCHEMICAL PROBE, California Univ., Los Angeles. Dept. of Geology. For primary bibliographic entry see Field 02K. W73-13294

IN SITU ACTIVATION ANALYSIS OF MARINE SEDIMENTS WITH CALIFORNIUM-252, Battelle Memorial Inst., Richland, Wash. Pacific Northwest Labs For primary bibliographic entry see Field 02K. W73-13295

IMPROVED WATER ANALYSIS KIT, Franklin Inst. Research Labs., Philadelphia, Pr For primary bibliographic entry see Field 07B.

W73-13297

ON MULTIDISCIPLINARY RESEARCH ON THE APPLICATION OF REMOTE SENSING TO WATER RESOURCES PROBLEMS.

Wisconsin Univ., Madison. Inst. of Environmental

Available from the National Technical Informa-tion Service as N73-13378, \$3.00 in paper copy, \$1.45 in microfiche. 1971-1972 Progress Report No NASA-CR-129797, 1972. 83 p, 31 fig, 13 tab, 7 ref. Contract No NGL-50-002-127.

Descriptors: "Remote sensing, "Water quality, "Monitoring, "Aquatic environments, "Research and development, "Water resources, Great Lakes, Pollutant identification, Laboratory tests, Model studies, On-site investigations, Methodology, Water pollution, Lake Superior, Lake Michigan, Mathematical models, Hydrologic properties, Powerplants, Aerial photography, Photogrammetry, Outlets, Eutrophication, Industrial wastes, Pulp waters, Pulp and paper industry. Aquatic Pulp wastes, Pulp and paper industry, Aquatic plants, Primary productivity, Ecosystems, Instru-

mentation.

Identifiers: Thermal scanning imagery, Lake Wingra, Myriophyllum spicatum, Macrophytes, Infrared radiometry, Oedogonium, Nuphar, Nymphaea, Lake Mendota, Data interpretation, Wisconsin River, Fox-Illinois River, Fox River, Galena River, Ceratophyllum demersum, Infrared

Progress has been made in relation to five specific water resources problems to which remote sensing techniques have been applied in on-going research. The problem areas are: (1) water pollution monitoring, (2) effluent mixing zone modeling, (3) current and circulation modeling, (4) determination of hydrologically active source areas, and (5) analysis of aquatic ecosystems. Briefly stated, the programs in these areas have the following objectives:

(1) To ascertain the extent to which special aerial otography can be used in monitoring water polphotography can be used in homorous water po-tution parameters through a comparison of photo imagery and actual pollution conditions. (2) To develop a relationship between the extent of the 'mixing zone' in terms of outfall effluent, and water body characteristics by utilizing the imagery obtained from intensive aerial remote sensing and applying the derived data in duplicating the 'mixing zone' charcteristics in a series of laboratory model studies. (3) To determine the fine scale structure and efficiency of nearshore circulation patterns in the Great Lakes through the use of thermal scanning imagery and analytic photogram-metric techniques. (4) To develop a remote sensing technique for determining the location and extent technique for determining the location and extent of source areas in a watershed. (5) To use remote sensing in the development of a production model for Myriophyllum spicatum L. in Lake Wingra, and to evaluate the field potential of remote sensing techniques in detecting the occurrence, intensity, duration and composition of algal blooms in the Madison, Wisconsin, area lakes. The methods and data for each of the 5 areas are given. (Mortland-Battelle) (Mortland-Battelle) W73-1329

TAXONOMIC GUIDES TO ARCTIC ZOOPLANKTON (VI): APPENDICULARIANS OF THE CENTRAL ARCTIC, MYSIDS OF THE ARCTIC OCEAN AND CONFLUENT SEAS, FIELD GUIDE TO ARCTIC ZOOPLANKTONIC CRUSTACEANS OSTRACODS OF THE CENTRAL CONFLORM TO THE CONFLORM TO THE CENTRAL CONFLORM TO THE CENTRAL CONFLORM TO THE CENTRAL CONFLORM TO THE CENTRAL CONFLORM TO THE CENTRAL CONFLORM TO THE CENTRAL CONFLORM TO THE CONFLORM TO THE CENTRAL CONFLORM TO THE CENTRAL CONFLORM TO THE CENTRAL CONFLORM TO THE CENTRAL CONFLORM TO THE CONFLORM TO THE CENTRAL CONFLORM TO THE CENTRAL CONFLORM TO THE CENTRAL CONFLORM TO THE CONFLORM TO THE CENTRAL CONFLORM TO THE CENTRAL C

University of Southern California, Los Angeles. Dept. of Biological Sciences.

Y-m. Leung. Available from the National Technical Informa-Available from the National Technical Information Service as AD-756 660, \$3.00 in paper copy, \$1.45 in microfiche. Technical Report No 2, October 1972. 48 p, 29 fig, 31 ref. Project No 307-270, Contract No N00014-67-A-0269-0013.

WATER QUALITY MANAGEMENT AND PROTECTION-Field 05

Identification of Pollutants-Group 5A

Descriptors: "Zooplankton, "Arctic Ocean, "Crustaceans, Invertebrates, On-site data collections, Benthic fauna, Arctic, Amphipoda, Copepods, Isopods. Identifiers: "Appendicularians, "Taxonomic guides, Macroinvertebrates, Mysids, Ostracods, Tunicates, Oikopleura spp, Fritillaria spp, Appendicularia, Kowlewskai, Euphausiids, Decapods, Bathyconchoecia, Boreomysis spp, Parerythrops spectabilis, Pseudomma frigidum, Michthyops theeli, Mysis spp, Conchoecia spp, Acetabulastoma arcticum

Six practical taxonomic guides to zooplankton were prepared to the USC Arctic Project to meet the needs to non-taxonomists involved with Arctic fauna. Material presented in this guide is based upon results of research by investigators associated with this Project and its precursors since 1952. This compilation is composed of information on the five species of ostracods and five species of appendicularians found amongst central Arctic zooplankton; mysids from the central Arctic and peripheral seas; and a general guide to Arctic zooplanktonic crustaceans. Each guide contains dichotomous keys and complementary illustrations, special notes on individual species, and selected references to literature pertaining to the included groups. (Holoman-Battelle)

THE ROLE OF PAPER MILL ADDITIVES AS POTENTIAL STREAM POLLUTANTS, Washington State Univ., Pullman. Coll. of Engineering. For primary bibliographic entry see Field 05B. W73-13338

MARINE MICROBIOLOGY, FIVE-YEAR PROCRESS REPORT, 1967-1972, Woods Hole Oceanographic Institution, Mass. S. W. Watson.
Available from NTIS, Springfield, Va., as COO-3565-1; 3400 in paper copy, \$1.45 in microfiche. Report Coo-3565-1, 1972. 46 p, 32 fig, 47 ref. AEC-

Descriptors: *Estuarine environment, *Marine bacteria, *Microbial degradation, *Nitrogen fixing bacteria, Cytological studies, Water pollutant identification, Biomass, Biochemistry, Biological properties, Nitrification, *Nitrates, 'Nitrites, Ureas, Organic compounds, Chemical reactions, Carbon radioisotopes, Analytical techniques.

A research program is summarized on microorganisms that oxidize ammonia to nitrite and nitrite to nitrate, including their fine-structure and biochemical properties, distribution, and the rates of the in-situ reactions. Degradation rates of urea, acctate, and glucose in estuarine and offshore waters were measured using labelled compounds. A test being developed that is specific for bacterial biomass in the presence of the biomass of other organisms also has potential applications in water pollution studies, determination of bacteria in sediment, and detection of contamination of radioisotope solutions intended for injection into patients. In this test, a lysate from the blood of the horseshoe crab is used to detect free bacterial lipopolysaccharides (also known as pyrogens or endotoxins). (Bopp-ORNL)

DETERMINATION OF AG, HG, AND ARSENIC IN SEAWATER. Battelle-Pacific Northwest Labs., Richland, Wash. Radiological Sciences Dept. For primary bibliographic entry see Field 05B. W73-13346

METHODOLOGY FOR THE IDENTIFICATION OF A BIOLOGICAL INDICATOR IN

RADIOECOLOGY: EXAMPLE OF CS137 AND A FRESHWATER MOLLUSC ANODONTA, (METHODOLOGIE POUR LA RECHERCHE D'UN INDICATEUR BIOLOGIQUE EN RADIOECOLOGIE).

D'UN INDICATEUR BIOLOGIQUE EN RADIOECOLOGIE),
L. Foulquier, and A. Lambrechts.
Available from NTIS, Springfield, Va., as CEA-R-4375; 57.60 in paper copy, \$1.45 in microfiche. Report CEA-R-4373, Sept 1972. 295 p, 71 fig, 65 tab, 118 ref.

Descriptors: *Bioindicators, *Nuclear wastes, *Radioisotopes, *Absorption, Public health, Path of pollutants, Radioecology, Water pollution effects, Monitoring, Molluscs, Estuarine environment, Phytoplankton, Temperature, Sediments, Food chains, Computer programs, Computer models, Potassium compounds.
Identifiers: Cesium radioisotopes.

A concentration factor of about 300 was found for a bivalve under conditions favoring uptake from food (chronic contamination of the water in the presence of phytoplankton, light, and silt). Also the uptake from food and sediment and effects of potassium, sediment agitation, temperature, and bivalve age were determined. A computer program modelled the simultaneous effects of three variables. In bivalves removed from contaminated water 38% of the total radioactivity was on the shell, 20% in the viscera, 22% in the other soft parts and 13% in internal fluid. After 81 days decontamination in uncontaminated water the loss of radioactivity by the shell was 52%; by the soft parts, 25%; and by the internal fluid, 50%. Long-term biological half-times are given for various components of the bivalve (66-90 days for the entire bivalve, 32-45 days for the shell, and 72-90 days for the soft parts), and also for the individual organs. The results are compared with those by other authors. (Bopp-ORNL)

EIGHTEENTH ANNUAL CONFERENCE ON BIOASSAY, ENVIRONMENTAL AND ANALYTICAL CHEMISTRY, OCT. 10-11, 1972, PROGRAM AND ABSTRACTS. Argonne National Lab., III.

Available from NTIS, Springfield, Va., as ANL-8014; \$4.00 in paper copy, \$1.45 in microfiche. Report ANL-8014, 1972. 39 p.

Descriptors: "Analytical techniques, Conferences, Radiosotopes, "Nuclear wastes, "Bioassay, Food chains, Aquatic environment, Estuarine environment, Benthic fauna, Tritium, Fallout, Soil analysis, Water analysis, Pollutant identification, Milk, "Path of pollutants, Instrumentation, Radioactivity, Public health, "Radiochemical analysis, Radioecology.

Identifiers: Plutonium, Environmental impact

Fourteen abstracts (of 25) concern analysis of radionuclides in humans or animals; ten abstracts concern analysis of water, soil, or freshwater and marine benthic organisms; and one abstract concerns the preparation of environmental impact statements. The ratio of the tritium specific activity in the organic or residue fraction to that in free water was 5-10 for soil and 1-12 for milk. Accumulations of radionuclides from nuclear powerplant discharges were located using a submersible NaI (TI) probe. In environmental samples, reactor-produced and atmospheric-fallout Pu were distinguished by alpha spectrometric determination of the Pu240/Pu239 ratio. However, for detection of Pu-Am in large soil samples (to 1 kg), a technique using low-energy X radiation was advantageous. (Bopp-ORNL)

ACTIVATION ANALYSIS OF TRACE ELE-MENTS IN BIOLOGICAL MATERIALS, (ANALYSE PAR ACTIVATION DE MECROQUANTITES D'ELEMENTS DANS LES MATERIAUX BIOLOGIQUE),
A. A. Kist, Ch. Khatomov, N. A. Krygenkova, S. Crestova, and R. Ya. Tuchkova.
Available from NTIS, Springfield, Va., as CONF-721069-44, \$4.00 in paper copy, \$1.45 in microfiche. Report CONF-721069-44, Oct 1972. 11 p, 3 fig, 2 tab.

Descriptors: "Pollutant identification, "Neutron activation analysis," Water analysis, "Gold, "Gold addioisotopees, "Trace elements, Pesticide residues, Chlorides, Vegetation, Absorption, Soil types, Soil-water-plant relationships, Biology, Root zone, Sampling, Geochemistry, Soil chemistry, Biochemistry, Metabolism, Analytical techniques, Separation techniques, Solvent extraction.

Developments in neutron-activation analysis have improved precision and increased sensitivity. Comparison with microanalytical techniques requiring ashing showed ashing losses of 5-70% with K, Na, Mn, Fe, Sc, Zn, Cu, S, and P. In biogeochemical studies the sensitivity for determination of Au in natural waters and in plants was about 1 ppb. Plant uptake was also studied for 5b, As, Sc, and Mn. Gold in natural water samples was absorbed on activated carbon to avoid loss from deposition on container walls. Pesticide residues were analyzed by chloride determination after inorganic chlorides has been eliminated by extraction techniques using chloride-free solvents. Eyetissue was analyzed for 15 elements; the concentration of iodide in the eye envelope was about 100 times that in blood and in most other human tissue. (Bopp-DRNL)

OCCURRENCE OF SE75 AND SN113 IN OYSTERS, Bhabha Atomic Research Centre, Bombay (India).

Health Physics Div.
B. Patel, and A. K. Ganguly.
Health Physics, Vol 24, p 559-562, 1973. 1 fig. 2

Descriptors: *Radioisotopes, *Bioindicators, *Nuclear wastes, *Pollutant identification, Water pollution sources, Monitoring, Radioecology, Mollusks, Gastropods, *Oysters, Effluents, Nuclear powerplants, Analytical techniques, Nadioactivity techniques, Marine animals, Estuarine environment, Absorption. Identifiers: Tin radioisotopes, Seleaium radioisotopes.

The specificity of various species of molluscs in the vicinity of the Tarapur nuclear powerplant for various radionuclides suggested their use as biological monitors. Gastropods (aplysia benedicti, Cellana radiata, and Onchidium verruculatum) concentrated Co radioisotopes; oysters (Crassostea cucullata and Crassostea gryphoides) concentrated Sn113 and Se75, which were identified by the energy of gamma spectrum lines and half lives; but not Co. The Sn113 probably results from neutron activation of Sn112 (isotopic abundance 0.95%) in fuel cladding and structural alloys; the Se75, from neutron activation of Se74 of unknown origin or as a fission product. Concentrations that have been reported in marine organisms are: Sn, 0.2-20 ppm; Se, 0.5-8.6 ppm. (Bopp-ORNL)

AUTOMATED WATER MONITORING INSTRU-MENT FOR PHOSPHORUS CONTENTS, Nuclear Corp. of America, Denville, N.J. Nuclear

Div. M. J. Prager.

Copy available from GPO Sup Doc as EPI.23/5:73-026, 80.50; microfiche from NTIS as PB-222 772, \$1.45. Environmental Protection Agency, Monitoring Series Report EPA-R4-73-

Group 5A—Identification of Pollutants

026, June 1973. 26 p, 6 fig, 2 ref. EPA Project 16020 GSB. 68-01-0111.

Descriptors: *Monitoring, *Phosphorus, Analytical techniques, *Flame photometry, *Pollutant identification, Automation, *Instrumentation,

A prototype instrument was developed for auto-matically monitoring total phosphorus in water. The analytical principle employed was flame emis-The analytical principle employed was traine emis-sion photometry. Phosphorus compounds burned in a hydrogen flame emit at about 525 mil-limicrons. Conditions were established for the sen-sitive measurement of phosphorus in water. Operating parameters investigated included fuel and air flow rates burner configuration, operating and an flow late of the committee of the of less than 2 parts per billion. A procedure was worked out for distinguishing between organic and inorganic phosphorus with ion exchange resins. In measurements designed to determine interference by sodium and calcium, it was observed that the method is about 1000 times more sensitive towards phosphorus than towards sodium and 5000 times more sensitive towards phosphorus than towards calcium. A prototype instrument was designed, fabricated and tested. (EPA) W73-13470

A SIMPLE TECHNIQUE FOR ISOLATION OF PELODERA CHITWOODI, A BA TERIOPHAGOUS NEMATODE, FROM SOIL, PELODERA RAC. Louisiana State Univ., Baton Rouge. Dept. of Plant Pathology.
M. M. Joshi, and G. R. Wilt.

Proceedings of the Helminthological Society of Washington, Vol 40, No 1, p 167-168. January 1973. OWRR A-0160ALA (4).

Descriptors: *Nematodes, *Bacteria, *Bacteriophage, *Isolation, Analytical techniques, Pollutant identification. Identifiers: *Pelodera, Agarbacterium, Vibrio

A technique is described which employs bacteria for the isolation of Pelodera chitwoodi from soil. Ten grams of mud infested with eight species of nematodes were placed in the center of an agared petri dish which had been innoculated with two drops of bacterial suspension 2-3 cm from the center. After three to four hours incubation, an examination showed that ninety-nine percent of the nematodes accumulated around the bacterial colonies were the bacteriophagous Pelodera chitwoodi. Several repeated experiments gave the same results. (Owen-Alabama) W73-13501

SOND CRUISE 1965: FACTOR AND CLUSTER ANALYSES OF THE PLANKTON RESULTS, A GENERAL SUMMARY, National Inst. of Oceanography, Wormley (En-

gland).
M. V. Angel, and M. J. R. Fasham.
Journal of the Marine Biological Association of
the United Kingdom, Vol 53, No 1, p 185-231,
February 1973. 14 fig, 15 tab, 46 ref.

Descriptors: *Distribution patterns, *Copepods, *Biological communities, *Amphipoda, Mathematical studies, Zooplankton, Invertebrates, Sampling, Marine animals.

Identifiers: *Data interpretation, *Ostracods, Standard Construc

*Euphausiids, *Chaetognaths, Factor analysis, Cluster analysis, Canary Islands, Macroinver-

The data for five planktonic taxa sampled during the SOND cruise (autumn 1965) by R. R. S. 'Discovery' in a day and a night series of horizon-tally towed nets have been analyzed by factor and

cluster analyses. The factor analyses of hauls showed that there were five biologically distinct zones in the water column between the surface and 1000 m. The zones were more distinct in the day series than in the night. Factor analyses of the individual taxa gave sensible groupings of species and the factor score plots gave 'averaged' depth distributions for each group. Cluster analyses of the individual taxa gave results consistent with the factor analyses. Both methods gave groupings which fitted the zonation patterns of the hauls, except for the two zones between 100 and 460 m at ht. Only cluster analyses could be carried out night. Only cluster analyses could be carried out on the total data matrices. Although satisfactory interpretation was only possible with the aid of the analyses of the individual taxa, the zonation and species groupings were again largely retained. The zonation of the planktonic taxa is very similar to that described for nektonic species sampled on the same cruise. The usefulness of these analytical methods is compared with the conclusions of other investigators. It is concluded that the rotation of the matrices to simple structure in the factor anal-ysis gave a marked improvement in the ease of interpretation. For the data, principal component analyses gave very similar results to the full factor analyses. (Little-Battelle) W73-13507

ENERGY FLOW IN A WOODLAND STREAM ECOSYSTEM: II. THE TAXONOMIC COM-POSITION AND PHENOLOGY OF THE CHIRONOMIDAE AS DETERMINED BY THE COLLECTION OF PUPAL EXUVIAE, Pittsburgh Univ., Pa. Pymatuning Lab. of Ecolo-

gy. For primary bibliographic entry see Field 05C. W73-13509

IDENTIFICATION BY MEANS OF RETENTION

PARAMETERS, Max-Planck-Institut fur Kohlenforschung, Muelheim an der Ruhr (West Germany). G. Schomburg, and G. Dielmann. Journal of Chromatographic Science, Vol 11, No 3, p 151-159, March 1973. 7 tab, 33 ref.

Descriptors: *Gas chromatography, *Organic compounds, Pollutant identification. Identifiers: *Kovats indices, *Retention time, *Retention volume, Hexane, Benzene, Methylpentanes, Hexenes, Cyclohexanes, Chlorohexanes, Hexanals, Hexanones, Hexanols, Cyclohexanones, Octenes, Methylnonane, Hexylcyclopropanes, Undecanes, Standardization, cyclopropanes, Reproducibility.

ntion parameters, preferably Kovats indices, can be used to identify chromatographically separated components of mixtures, and in addition, chemical derivatives thereof. For reliable correlations of peaks, combined use of other mainly spectroscopic identification methods is necessary. There are two different methods of applying Kovats indices which are table match and/or incremental predictions of I and delta I values. Identification by table matching is demonstrated. strated with saturated and unsaturated hydrocarbons from C5 to C6 of a gasoline cut and C6 compounds. Identification by retention increments is demonstrated with 1-ocetene, 2-methylnonane, 3methylnonane, hexyl-cyclopropane, methyl-branched undecanes, and unsaturated and methylbranched cyclopropanes. The extended use of retention parameters are limited until recently because of a lack in data reproducibility due to column polarity and apparatus parameters. Proposals are made as to how these difficulties may be overcome and as to now these difficulties may be overcome and as to the corrections and standardizations which may be made in order to obtain precise data. (Little-Battelle) W73-13511 THE SIGNIFICANCE OF HYDROCARBON AS-SIMILATION IN YEAST IDENTIFICATION, nische Hogeschool, Delft (Netherlands). Lab. of Microbiology.
P. Bos, and J. C. de Bruyn.
Antonie van Leeuwenkoe

Antonie van Leeuwenkoek, Vol 39, No 1, p 99-107, 1973. 4 tab. 35 ref.

Descriptors: "Yeasts, "Pollutant identification,
"Systematics, Organic compounds, Classification,
Aquatic fungi, Pathogenic fungi, Marine fungi.
Identifiers: "Assimilation, "Hydrocarbons, Substrate utilization, Octane, Decane, Hexadecane,
Alkanes, Nutrient sources, Candida spp, Ascomycetes, Basidiomycetes, Fungi imperfecti, Culture media, Ambrosiozyma cicatricosa, Debaryomyces nepalensis, Hansenula spp, Pichia spartinae
spp, Saccharomyces cordubensis, Saccharomyces
gaditensis, Bullera dendrophila, Sporobolomyces
antarcticus, Brettanomyces, Torulopsis spp,
Trichosporon spp, Selenotila spp, Debaryomyces
spp, Metschnikowia spp, Lipomyces spp,
Schwanniomyces spp, Selenotila spp, Hansenula
spp, Saccharomyces spp, Selenotila spp, Hansenula
spp, Saccharomyces spp, Kluyveromyces spp,
Trichosporon aquatile, Trichosporon cutaneum
var. antarcticum. Descriptors: *Yeasts, *Pollutant identification,

A large number of yeasts were screened for the ability to assimilate hydrocarbons. Not only representatives of the genus Candida, but also spe-cies from other perfect and imperfect genera are cies from other perfect and imperfect genera are able to use n-alkanes as sole carbon and energy source. The significance of this feature in yeast systematics is discussed. In general, all strains of a species share either the ability to assimilate hydrocarbons or the failure to do so. Exceptions are found in species recorded as heterogeneous are found in species regarded as heterogeneous, like Candida sake, Candida diddensii and Candida zeylanoides. In cases where the usual criteria used zeylanoides. In cases where the usual criteria used in identification seem to be inadequate, the simple hydrocarbon assimilation test may be useful. Also in subgrouping the genera Candida and Torulopsis the test may be of value, because some perfect genera like Hansenula, Kluyveromyces and Saccharomyces lack hydrocarbon-assimilating representatives. (Holoman-Battelle) W73-13512

DIFFERENTIATION OF MYCOBACTERIUM TUBERCULOSIS FROM OTHER MYCOBACTERIA BY SUSCEPTIBILITY TO ETHYL AND METHYL ESTERS OF P-NITROBENZOIC

Chubu Chest Hospital, Obu (Japan). For primary bibliographic entry see Field 05C. W73-13513

MERCURY RESIDUES IN FISH, 1969-1970 - NA-TIONAL PESTICIDE MONITORING PRO-GRAM, Bureau of Sport Fisheries and Wildlife, Washing-

Dureau of Sport Fisheries and Windine, Washington, D.C. Div. of Fishery Research.
C. Henderson, A. Inglis, and W. L. Johnson.
Pesticides Monitoring Journal, Vol 6, No 3, p 144159, December 1972. 2 fig., 2 tab, 8 ref.

Descriptors: *Mercury, *Freshwater fish, *Marine fish, Heavy metals, Sampling, Rivers, United States, Lakes, Hudson River, Connecticut River, States, Lakes, Hudson Kiver, Connecticut Kiver, Potomac River, Colorado River, Mississippi River, Rio Grande River, St. Lawrence River, Lake Ontario, Lake Erie, Lake Huron, Lake Michigan, Lake Superior, Ohio River, Missouri River, Columbia River. Identifiers: *Biological samples, *Sample preparation, *Atomic absorption spectrophotometry, Methylmectury.

Methylmercury.

As part of the fish monitoring program conducted by the Bureau of Sport Fisheries and Wildlife since 1967, composite fish samples collected dur-ing the fall of 1969 and 1970 were analyzed for mercury. Fish were collected using seives, gill nets, traps, hook and line, and electrofishing.

Three composite samples, each of a different species and consisting of 3-5 adult fish, were collected at each of 50 monitoring stations in 1969; similarly, three composite samples and in most cases a replicate sample of one of the species were collected at each of 100 stations in 1970. Stations were located on major rivers and lakes throughout the United States. Samples were wrapped in foil, frozen, and shipped to a laboratory for analysis by atomic absorption. Each composite was thawed, cut in small pieces, homogenized in a food chopper, digested, and analyzed by the cold vapor technique. Total mercury residues equal to or exceeding the sensitivity level of 0.05 ppm were found in 129 of the 145 samples in 1969 and 373 of the 393 samples in 1970. Values ranged from less than 0.05 to 1.25 ppm in 1969 samples and from less than 0.05 to 1.25 ppm in 1969 samples and from less than 0.05 to 1.80 ppm in 1970 samples. Analyses by two different laboratories of 40 selected samples from the 1970 collection gave Analyses by two different laboratories of 40 selected samples from the 1970 collection gave comparable results. Analyses of 24 selected 1970 samples indicated that 90 percent or more of the mercury in fish was in the form of methyl mercury. (Little-Battelle) W73-13514

ESTIMATING WATER QUALITY FROM ELEC-

TRICAL LOGS, Geological Survey, Baton Rouge, La. For primary bibliographic entry see Field 04B. W73-1356

FRESHWATER DIATOMS IN THAILAND,

Nova Hedwigia, Vol 22, Nos 1-2, p 267-370, 1971.

Descriptors: *Diatoms, *Chrysophyta, *Aquatic algae, Aquatic plants, Systematics.
Identifiers: *Thailand, Achnanthes spp

In freshwater material collected in 1966 in the central and northern part of Thailand about 378 diatom taxa are found, among which there are 8 new species, 5 new varieties and 2 new forms. All the diatoms found are listed and drawings and photographs from the researched material are given (Holomen Pattle) given. (Holoman-Battelle) W73-13570

ANALYTICAL APPLICATIONS POLYAMINE-POLYUREA CHELATING

Massachusetts Univ., Amherst.

J. F. Dingman, Jr.
Available from Univ. Microfilms, Inc., Ann Arbor, Mich. 48106 Order No. 73-5534. PhD Dissera-tion, 1972. 150 p.

Descriptors: "Aqueous solutions, "Separation techniques, "Heavy metals, "Resins, Analytical techniques, "Chelation, Chemical reactions, Water analysis, Cation exchange, Cadmium, Cobalt, Copper, Manganese, Nickel, Zinc, Selectivity, Pollutant itdentification, Cations. Identifiers: Preconcentration, "Ion exchange resins, "Polyamine resins, "Polyame resins, Chelating, Resin synthesis, Trace levels, Metal complexes, Sample preparation, Polythiourea resins, Polydithiocarbamic acid resins, Atomic absorption spectrophotometry, Silver, Detection limits, Natural waters, Column chromatography.

Analytical applications were investigated of a family of weak base, polyamine ion exchange resins with regard to their ability to form transition metal ion complexes from aqueous solutions. The resins are selective for those metals which readily form amine complexes, and hence alkali and al-kaline earth elements are not adsorbed. This is desirable in the separation, concentration, and measurement of ultra-trace heavy metal cations from natural waters which are abundant in the Groups IA and IIA elements. The program con-

sisted of three phases: the resin synthesis, the study of the metal-amine complex formation on sisted of three pnases, survived to the metal-amine complex formation on the resin, and the study of the ability of the polyamine resins to selectively sequester trace heavy metal cations from aqueous solutions for preconcentration purposes. Toluene disocyanate was used to polymerize and cross-link monomeric many control of the polyamine and polyamin preconcentration purposes. Toluene diisocyanate was used to polymerize and cross-link monomeric soluble polyamines from the polyethyleneimine family. Resins from ethylenediamine, and polyethyleneimine monomers having average molecular weights of 1200 and 1800 have been synthesized. A number of resin synthesis methods were developed. Methods were developed to coat effectively these resins on solid supports. Adsorption isotherms of some heavy metal cations on the resins were established through batch equilibration procedures. The ability of the polyamine resins were established through batch equilibration procedures. The ability of the polyamine
resins to sequester trace metal ions and then
release the metals upon acidification was assessed
by passing known, dilute concentrations of the
desired metals through the resin, eluting with
hydrochloric acid, then determining the percentage recovery of the metal ions. With a concentration factor of X1000, the successful analysis of
these metals was achieved at the low concentration of 0.2 ppb. Other chelating ion exchange
resins were synthesized for use as substrates in the
metal sequestration study. (Holoman-Battelle)
W73-13571

WATER: EXAMINATION, ASSESSMENT, CONDITIONING, CHEMISTRY, BACTERIOLOGY, BIOLOGY. K. Holl.

Water de Gruyter, New York, New York. 1972.

Descriptors: "Waste water (Pollution), "Water analysis, "Methodology, "Potable water, "On-site investigations, "Laboratory tests, "Pollutant identification, Biological properties, Water chemistry, Water properties, Chemical analysis, Water quality, Indicators, Water pollution, Water sampling, Swimming pools, Mineral water, Surface waters, Aquatic microbiology, Domestic wastes, Industrial wastes, Eutrophication. Identifiers: Sample preservation, Potassium permanganate consumption, Ammonium ions, Medicinal water, Agars, Culture media, Aluminum Medicinal water, Agars, Culture media, Aluminum sulfate, Counting, Brewery wastes, Carcinogens, Biochemical tests, Mineral oil, Core samplers, Cyanides, Radioactive decontamination, Dithizone methods, Enterococci, Ferric chloride, Hydrogen peroxide, Hydrazines, Klebsiella spp, Membrane filters, Most probable number test, Proteus spp, Pollutant removal, Settleability, Staphylococci, Streptococci, Suspended matter, Sterilization, Urine, Hellige method, Nitron method, Ion selective electrodes.

This book is concerned with the investigation and quality assessment of primarily drinking water. Due to the interrelationship of potable water with other types of water, including wastewater, those topics are also treated. Areas of interest that are topics are also treated. Areas of interest that are covered include (1) general on-site investigations and laboratory tests, (2) chemical examination methods, (3) pollution indicators, (4) tap water analysis, (5) examination and assessment of swimming bath water, surface waters, and wastewater, (6) the bacteriology of drinking water, and (7) the biology of water. (Holoman-Battelle) W73-13573

RESULTS OF DRINKING WATER TESTING IN THE SZCZECIN PROVINCE AREA UNDERTAKEN AS PROPHYLACTIC MEASURE AGAINST ALIMENTARY POISONING OF IN-

FANTS, (IN POLISH), H. Pilawaka, and D. Torum. Rocz Panstw Zaki Hig. Vol 22, No 6, p 665-671.

1971. Illus. English summary.
Identifiers: *Alimentary poisoning, *Infant diseases, Measure, Poisoning, *Poland (Szczecin),
Prophylactic, Testing, *Potable water.

CHEMICAL TESTING OF DRINKING WATER WAS CONDUCTED ROUTINELY FOR 4 YR IN 122 RANDOMLY CHOSEN RURAL WELLS LOCATED ON INDIVIDUAL FARMS IN THE LOCATED ON INDIVIDUAL FARMS IN THE SZCZECIN Province area of Poland. The tests included nitrate level determinations. In 78% of the cases, the amount of nitrates exceeded the 10 mg NNO3/1 level considered permissible in drinking water for infants. A proposal is made to introduce compulsory testing of the well water on those farms where the family is expecting offspring.—Copyright 1973, Biological Abstracts, Inc. W73-13581

COLORIMETRIC ASSAY FOR CARBOX-YMETHYLOXYSUCCINATE, A NEW DETER-GENT BUILDER, Lever Bros. Co., Edgewater, N.J. Research

Journal of the American Oil Chemists' Society, Vol 50, No 6, p 213-217, June 1973. 5 fig, 6 tab, 30

Descriptors: *Assay, *Detergents, *Methodology, *Water analysis, *Pollutant identification, *Spec-trophotometry, *Waste identification, Colorimetry, Sewage effluents, Color reactions, Chemical reactions, Waste water (Pollution), Chemical analysis, Organic compounds, Organic Chemical reactions, Waste water (Pollution), Chemical analysis, Organic compounds, Organic acids, Sewage treatment, Pollutants. Identifiers: Trisodium carboxymethyloxysuc-

Identifiers: Trisodium carboxymethyloxysuc-cinate, Chemical interference, Sample prepara-tion, Sensitivity, Accuracy, Quantitative analysis, Detection limits, "Carboxymethyloxysuccinate, Dextrose, Glycolic acid, Acetaldehyde, Butyral-dehyde, Formaldehyde, Propionaldehyde, Benzo-ic acid, Citric acid, Fumaric acid, Gluconic acid, Lactic acid, Malic acid, Oxalic acid, Oxaloacetic acid, Succinic acid, Trataric acid, Beta-naphthol acid, Succinic acid, Tartaric acid, Beta-naphthol, Absorption spectra, Chemical recovery.

A spectrophotometric assay was developed for the quantitative determination of carboxymethylox-ysuccinate (CMOS), a new detergent builder. The ysuccinate (CMOS), a new detergent builder. The method was based on the color produced with beta-naphthol in 92.5 percent (w/w) sulfuric acid. As little as 1.0 microgram of carboxymethylox-ysuccinate can be measured. Pretreated and untreated samples from sewage effluents and river waters were prepared with solutions of CMOS ranging from 1 to 30 pm. The samples were centrifuged, Millipore-filtered through a 0.22-micron membrane, and acidified with concentrated HCL to 1.0 N. Milliliter samples were placed into test tubes, evaporated to dryness and assayed according to the prescribed procedure. The CMOS recovery values were almost identical in both the sewage effluent and river water samples; the mean absolute recovery values (least squares slopes) absolute recovery values (least squares slopes) were 97 and 96.4 percent, respectively. The recovery of similar amounts from the same samrecovery of similar amounts from the same sam-ples, which were treated under the pretreatment procedure, was 94.5 percent for the primary sewage and 93.7 percent for river water. The results of an investigation to determine which compounds may interfere with detection of CMOS showed that under the prescribed account. compounds may interfere with detection of CMOS showed that under the prescribed assay conditions, glycolic, lactic, tartaric and dextrose equal in weight to CMOS, contributed only 1.2, 1.5, 4.7 and 1.5 percent errors, respectively. These small errors could be tolerated in most instances. Of particular significance was the lack of interference from the Krebs cycle intermediates, citric, fumarism molitic explosion from the conditions of the Composition of the Composi from the Kress cycle intermediates, citrc, tumar-ic, malic, oxaloacetic and succinic acids. Formal-dehyde and acetaldehyde were also included in this experiment but displayed no absorbances, since both compounds were removed during the evaporation step. The addition of HCl and evaporation steps not only permitted the use of very dilute samples and an initial concentration of 92.5 percent for maximum sensitivity, but also provided additional specificity to the method by reducing interferences from glycolic and lactic acids, and dextrose. (Holoman-Battelle)

Group 5A—Identification of Pollutants

AN IMPROVED METHOD FOR THE ANALYSIS

OF LINEAR ALKYLATE SULFONATE, Calspan Corp., Buffalo, N.Y. L. K. Wang, J. Y. Yang, and M. H. Wang. Preprint, presented at the 28th Annual Purdue In-dustrial Waste Conference, Purdue University, 1572, 1981, 1972, 1981, 1972, 1981, 1982, 1981, 1982, 1981, 1982, 1981, 1982, 1981, 1982, 1981, 1982, 1982, 1981, 1982, 1981, 1982, 198 Lafayette Indiana. May 1973; 18 p, 1 fig, 2 tab, 4

Descriptors: "Surfactants, "Detergents, Aqueous solutions, Saline water, Sea water, "pollutant identification, Analytical techniques, Water analysis, "Linear alkylate sulfonates, Volumetric analysis

Identifiers: Quarternary ammonium salt, Sodium tetraphenylboron, Two-phase titration, *Anionic

The wide usage of linear alkylate sulfonate type detergents in both domestic and industrial appli tions together with the known toxicity of these pollutants has made the surveillance of anio surfactant discharges in waste water effluents one of the most important water quality safeguard requirements. The needed routine analysis task is nplicated by the acknowledged difficulty inherent in the determination of trace quantities of anionic detergents in saline water. The current accepted procedures are designed mainly to establish an upper limit of the surfactant content and their applicability is limited to water samples free of applications is inflicted to water samples free or other major pollutants. The improved procedure developed in this study is suggested for a broader application to the analysis of anionic surfactants in polluted fresh or saline waters. W73-13643

DETERMINATION OF MERCURY IN GEOLOGIC MATERIALS BY FLAMELESS ATOMIC ABSORPTION SPECTROMETRY, Geological Survey, Washington, D.C.
J. Marinenko, I. May, and J. I. Dinnin.
Geological Survey, Bod Deeps 200 B. p. 151-1515

J. Marinenko, I. May, and J. J. Dahma. Geological Survey Prof. Paper 800B, p B151-B155, 1972. 3 fig, 2 tab, 13 ref. 23 Mercury, Geological investigations, *Analytical techniques, Sampling, investigations, *Analytical techniques, Sampling, Calibrations, Geology, Statistical methods, *Pollu-

tant identification. Identifiers: *Atomic absorption spectroscopy, Geological materials, Sample preparation, Combustion tubes, Errors.

A flameless atomic absorption method is described for determining submicrogram amounts of mercury. Powdered samples are heated with a calcium oxide-cupric oxide flux in a quartz com-bustion tube packed with lime and elemental copper. Evolved mercury vapor is swept through a packing of gilded silica where it is amalgamated. The amalgam is rapidly heated and the released mercury vapor is swept through an absorption cell and determined by atomic absorption spec-trometry. Two nanograms of mercury absorb 1 percent of the incident signal. Tracer studies with Hg 203 indicated 97 percent recovery of mercury at submicrogram levels during the sintering and amalgamation step. The release of submicrogram levels of mercury from the gilded silica for its detection by atomic absorption is better than 99 percent complete. (Oleszkiewicz-Vanderbilt) W73-13649

5B. Sources of Pollution

SULFUR BUDGET OF LAKE SHELBYVILLE, UPON CHAOBORUS,
Illinois Univ., Urbana. Water Resources Center.

W. U. Brigham, and S. R. Gnilka. Available from the National Technical Informa-Available from the National Technical Information Service as PB-222 497, \$3.50 in paper copy, \$1.45 in microfiche. Research Report No 66, June 1973. 59 p, 5 fig, 7 tab, 30 ref. OWRR A-056-ILL (1), 14-31-0001-3813. Descriptors: Limnology, "Sulfur, "Bacteria, Reservoirs, Bioassay, "Illinois, "Sulfur bacteria, Regression analysis, Water pollution sources, Water pollution effects. Identifiers: "Choaborus, "Lake Shelbyville (III).

The sources and annual cycle of sulfur were studied in the Lake Shelbyville Basin, Illinois, from 6 April 1972 through 28 March 1973. Three sources of sulfur were identified: rainfall, surface runoff, and pollution. Decomposition of inundated organic matter and solution of inorganic sulfur compound from the inundated basin were considered one time sources. Exchange between groundwater and the lake was considered to be in long-term equilibrium. Significant relationships between sulfate loading and discharge were detected. Regression analysis yielded an accurate means of calculating sulfate concentration from discharge ents. Green sulfur bacteria were isolated measurements. Green suttur oacteria were isolated from lake samples during the study year. During the previous summer stagnation period, purple sulfur bacteria were detected accompanying noticeable concentrations of hydrogen sulfide. Static bioassay studies of Chaoborus larvae yielded a minimum effect level for sulfide of 0.64 mg liter-1 (as S) for a 4-hour test. Pupae responded more rapidly to sulfide than did larvae. Relatively brief ure to a low sulfide concentration was sufficient to kill or immobilize a substantial per-centage of the test organisms. W73-13005

FACTORS CONTROLLING COPPER (II) CON-CENTRATIONS IN THE KEWEENAW WATER-

WAY, Michigan Technological Univ., Houghton. Dept. of Chemistry and Chemical Engineering. D. G. Leddy.

Available from the National Technical Informa-Avanage from the National Technical Informa-tion Service as PB-222 463, \$4.25 in paper copy, \$1.45 in microfiche. Michigan State University, East Lansing, Project Completion Report, In-stitute of Water Research, July 1973. 105 p., 22 fig, 5 tab, 16 ref, 2 append. OWRR A-065-MICH (1). 14-31-0001-3822.

Descriptors: *Copper, *Mine wastes, Lake Su-Descriptors: 'Copper, 'Maine wastes, Lake Su-perior, 'Michigan, Copper compounds, Model stu-dies, "Chemical reactions, Water chemistry, Lethal limit, Toxicity. Identifiers: "Torch Lake (Mich), Keweenaw Waterway (Mich), Mine tailings.

The occurrence of copper (II) in the Keweenaw Waterway from past use of the waterway as a dumping basin for copper-bearing mine tailings is a matter of concern because of the toxic effects of copper (II) on aquatic organisms. From 1972 to the present soluble copper as well as several other cations and anions were monitored at varying depths in water exposed to mine tailings. According to water chemistry the Keweenaw Waterway may be divided into two areas: one consists of Torch Lake, and the other area is the remainder of the Lake, and the other area is the remainder of the waterway, i.e., Portage Lake and the ship canal. The soluble copper (II) in the Portage Lake and ship canal section varies from 5 to 50 ppb and is controlled by the low copper concentration (8 ppb) water of Lake Superior which flushes this section of the waterway. The soluble copper (II) in Torch Lake seems to be controlled by a combination of chemical precipitation, dissolution, complex formation, and physical adsorption. Soluble copper in Torch Lake varies between 30 and 100 ppb. The model proposed as a description of soluble copper concentration control in Torch Lake predicts Cu++, CuCO3 (soluble), CuOH+, and Cu (organic) to be the principal copper species in solu-Cu++, CuCO3 (soluble), CuOH+, and Cu (organic) to be the principal copper species in solution. Cu (organic) is at times equal to 50 per cent of the total dissolved copper. lonic copper (Cu++) is found at times to reach extremely toxic levels. The model does not predict the exact concentrations observed; it does predict the general trend. W73-13010

INTERACTION BETWEEN MARINE ORGAN-ISMS AND OIL POLLUTION, Woods Hole Oceanographic Institution, Mass. Woods Hole Oceanographic Institution, Mass. For primary bibliographic entry see Field 05C.

FINITE ELEMENT SOLUTION TO UNCON-FINED GROUNDWATER FLOW WITH INFIL-TRATION, Rhode Island Univ., Kingston. Dept. of Civil Engineering. W-H. Chen.

M Sc Thesis, 1971. 104 p, 16 fig, 42 ref. OWRR-A-036-RI(2)

Descriptors: "Groundwater movement, "Recharge, "Path of pollutants, "Finite element analysis, Numerical analysis, Computer programs, Infiltration, Seepage, Sewage disposal.

Saturated, seepage, sewage disposal.

Saturated, steady-state, unconfined groundwater flow may be calculated with a computer program which is particularly suitable for flow through heterogeneous and anisotropic porous media with complex geometric boundaries. The program can handle problems with a vertical or nearly vertical free surface. Infiltration at the free surface can also be handled with ease. An example demonstrates the applicability of the computer program. The problem concerns a two-demensional flow from a sewage-disposal field to a water-supply source. The solution is in terms of the relation between the spacing of the sewage disposal field and the water-supply source and time; in conjunction with a field test for verification and modification, it should be helpful for sanitary engineers who wish to investigate the pollution of groundwater sources. (Knapp-USGS)

AQUATIC ORGANISMS AND HEAVY METALS IN MISSOURI'S NEW LEAD BELT, Missouri Univ., Rolla. For primary bibliographic entry see Field 05C. W73-13037

REGIME, THEORY, AND METHODS OF CAL-CULATION AND MEASUREMENT OF SEDI-MENTS AND WASTE WATERS (REZHIM, TEORIYA, METODY RASCHETA I IZ-MERENIYA NANOSOV I STOCHNYKH VOD). Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02J.
W73-13045

AN IMPROVED QUICK-FIELD METHOD OF CALCULATING WASTE WATER DILUTION IN RIVERS (USOVERSHENSTVOVANIYE EK-SPRESS-METODA RASCHETA RAZ-BAVLENIYA STOCINYKH VOD V REKAKH), Canadastranski Giddosickeki Institut, Legio. darstvennyi Gidrologicheskii Institut, Len grad (USSR). M. A. Bestsennaya.

M. A. Beststennaya. In: Rezhim, teoriya, metody rascheta i izmereniya nanosov i stochnykh vod; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 191, p 201-208, Leningrad, 1972. 2 fig, 2 tab, 4 ref.

Descriptors: *Analytical techniques, *Waste water (Pollution), *Waste dilution, *Self-purification, Rivers, Streams, Discharge (Water), Flow, Hydraulic properties, Dimensional analysis, Curves, Equations, Path of pollutants.

A modified version of a quick-field method developed by the author for calculating waste water dilution in small rivers is described. Results are presented of a numerical experiment to improve and refine earlier relations, and new working formulas consider channel shape and resistance to flow. The modification proposed can also be used for approximate calculations of waste

WATER QUALITY MANAGEMENT AND PROTECTION-Field 05

Sources of Pollution—Group 5B

water dilution in average-size and large rivers. (See also W73-13045) (Josefson-USGS) W73-13054

CONTRIBUTIONS OF ALLOCHTHONOUS DETRITUS TO THE ENERGY REGIME OF DOE RUN, MEADE COUNTY, KENTUCKY, Louisville Univ., Ky. Water Resources Lab.

C. R. Liston. Research Report, May 1972. 104 p, 10 fig, 22 tab, 66 ref, append. OWRR A-032-KY (1).

Descriptors: "Nutrients, "Leaves, "Ecosystems, "Riparian plants, Organic matter, Food chains, Maple trees, Oak trees, Beech trees, Hickory trees, "Kentucky, Amphipoda, Degradation (Decomposition), Streams, Surface waters, Energy, Aquatic environment, Leaching, Biodegradation, Lipids, Proteins, Carbohydrates. Identifiers: "Aquatic ecosystems, Beech trees.

Leaves from deciduous riparian trees provide an important source of energy and nutrients for aquatic ecosystems, especially in temperature climates. A study was undertaken in a spring-fed, woodland stream in north-central Kentucky to determine the kinds and amounts of leaves that entered the stream throughout the year, their calorific equivalents, and the protein, lipid, and carbohydrate contents of those leaves and the rates at which they were lost when submerged in the streams. Annual accumulation was 334 g/sq. m/year for an estimated total of 17,700 kg. the streams. Annual accumulation was 334 g/sq m/year for an estimated total of 17,700 kg. Calorific equivalents for 15 different kinds of leaves ranged from 3,789 cal/g dry weight for hickory to 4,417 cal/g for red oak. The upper 5 km of Doe Run received nearly 70 million ket al of energy from allochthonous leaf material from October 1, 1968, through September 30, 1969. The sugars and related substances leached rapidly into the streams, the lipid content leached slowly, and the rotein content increased during an 8 week period protein content increased during an 8-week period. Amphipoda showed the following preference of leaves as food: hickory, red elm, sugar maple, beech, red oak, and sycamore. (Knapp-USGS)

INTERACTION OF YELLOW ORGANIC ACIDS WITH CALCIUM CARBONATE IN FRESH-

WATER, Michigan State Univ., Hickory Corners. W. K. Kellogg Biological Station. A. Otsuki, and R. G. Wetzel.

A. Ostaki, and R. O. Wetzer. Limnology and Oceanography, Vol 18, No 3, p 490-493, May 1973. 2 fig, 1 tab, 18 ref. NSF GI-20 and GB-31018X, AEC AT (11-1)-1599, COO-1599-

Descriptors: *Organic matter, *Calcium car-bonate, Lipids, Humic acids, Adsorption, Crystallization, Calcite.
Identifiers: Yellow organic acids.

Large amounts of soluble yellow organic humic acids are removed from lake water with precipitat-ing CaCO3 by adsorption and incorporation into crystals during nucleation. This mechanism may crystals during nucleation. This mechanism may function as a seavenger of trace metals (especially iron) which are complexed with yellow acids in natural waters. Calcium carbonate particles selectively adsorb lipid material from natural waters. Yellow acids behave like lipid material with respect to association with CaCO3 particles. Yellow acids can be reextracted by 0.1 M sodium acetate and 0.1 M sodium bicarbonate solutions from butanol, which also suggests that they have the characteristics of strong organic acids, rather than of phenolic compounds. (Knapp-USGS) W73-13058

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SIZE CLASSES OF ORGANIC CARBON IN SEAWATER, Dalhousie Univ., Halifax (Nova Scotia). Inst. of

Oceanography. J. H. Sharp.

Limnology and Oceanography, Vol 18, No 3, p 441-447, May 1973. 2 fig, 3 tab, 34 ref.

Descriptors: *Colloids, *Organic matter, *Sea water, *Particle size, Carbon, Filters, Filtration.

Using carbon analyses, four size classes of organic matter in seawater were defined. An appreciable portion of the organic matter is smaller than the usually defined particulate class, but is probably not truly dissolved. This portion can be segregated using very fine membrane filters and by using membranes designed for forced dialysis. This subparticulate class should be considered as colloidal organic matter. (Knapp-USGS)

WATER POLLUTION: ENVIRONMENTAL IM-WATER POLLUTION: ENVIRONMENTAL IM-PACTS AND MEANS OF CONTROL, Rutgers-The State Univ., New Brunswick, N.J. Water Resources Research Inst. For primary bibliographic entry see Field 05G. W73-13078

FLOW PROPERTIES OF SUBMERGED HEATED EFFLUENTS IN A WATERWAY, National Aeronautics and Space Administration, Langley Station, Va. Langley Research Center. J. A. Campbell, and J. S. Schetz.
AIAA Journal, (American Institute of Aeronautics and Astronautics), Vol 11, No 2, p 223-230, Feb. 1973. OWRR-B-041-VA (3).

Descriptors: *Heated water, Injection, Flow characteristics, *Jets, *Thermal pollution, Path of pollutants. Identifiers: *Heated effluents, Jet path.

An experimental and theoretical investigation ha hen undertaken to study the trajectory and growth of thermal effluents having a range of discharge velocities and temperatures. The discharge of an effluent into a waterway was mathematically modeled as a submerged jet injection process by using an integral method which accounts for natural fluid mechanisms such as turbuence, entrainment, buoyancy, and heat transfer. The analytical results are supported by experimen-tal data and demonstrate the usefulness of the that data and commission the discharges of the effluent with respect to the discharge point. The capability of predicting jet flow properties, as well as the jet path, was enhanced by obtaining the jet cross-sectional area during the solution of the conservations countries to make the forest properties. cross-sectional area during the solution of the con-servation equations (a number of previous studies assume a specific growth for the area). Realistic estimates of temperature in the effluent were acquired by accounting for heat losses in the jet flow due to forced convection and to entrainment of freestream fluid into the jet.

NITRIFICATION AND DENITRIFICATION - A SELECTED BIBLIOGRAPHY, North Carolina Univ., Chapel Hill. Dept. of Environmental Sciences and Engineering. R. C. Sims, and L. W. Little. UNC Wastewater Research Center Report No 14, February 1971. 19 p, 170 ref. EPA Project 11010 DGA. 14-12-505.

Descriptors: *Bibliographies, *Water pollution sources, Water pollution effects, Water pollution control, *Nitrogen, Soils, Effluents, Sewage treatment, *Waste water treatment, *Nitrification,

This report comprises a selected bibliography of 170 references on nitrification, and denitrification pertinent to the microbiological processes involved; transformations of nitrogen in water, wastewater, and soil; sources of nitrogen in water and wastewater; and methods for removing nitrogen from wastewater.

W73-13085

THE EFFECT OF GROUND WATER LEVEL ON WATER MOVEMENT IN PEAT: A STUDY USING TRITIATED WATER, Macaulay Inst. for Soil Research, Aberdeen (Scotland). land).

For primary bibliographic entry see Field 04A. W73-13093

FOSSIL PIGMENTS IN THE SURFACE SEDI-MENTS OF A MEROMICTIC LAKE, Minnesota Univ., Minneapolis. Dept. of Botany. E. Gorham, and J. E. Sanger. Limnol Oceanogr. Vol 17, No 4, p 618-622, 1972.

Identifiers: *Fossil pigments, Lakes, *Meromictic lakes, Sediments, *Wisconsin, *Lake sediments.

Pigment concentration and diversity were mea-sured in surface sediments on a transect across a small, meromictic lake in northwest Wisconsin. Pigment concentrations increase several fold and diversity by a third from the shallowest to the deepest sediments. Monimolimnetic chlorophyll derivatives are about 3 X and carotenoids nearly 2 USENVALUES ARE ADOUG 3 X and carotenoids nearly 2 X the hypolimentic maxima in holomictic, eutrophic Minnesota lakes. Lower pigment concentrations at the deepest point along the transect suggest alumping of littoral detritus.—Copyright 1973, Biological Abstracts, Inc. W73-13099.

LOSSES OF ATRAZINE IN RUNOFF WATER

LOSSES OF ATRAZINE IN RUNOFF WATER AND SOIL SEDIMENT,
Pennsylvania State Univ., University Park. Dept. of Soil Chemistry.
J. K. Hall, M. Pawlus, and E. R. Higgins.
J Environ Qual. Vol 1, No 2, p 172-176, 1972. Illus. Identifiers: "Atrazine loss, Herbicides, Oats, Runoff, Sediment, Soil sediment, Toxicity, Zeamays, "Pennsylvania, "Corn.

Atrazine losses in runoff water and soil sediment were determined in 1967 and 1968 after 7 rates (0, 0.6, 1.1, 2.2, 4.5, 6.7 and 9.0 kg/ha) of atrazine were applied pre-emergent to corn (Zea mays L.) seeded on field plots of Hagerstown silty clay loam (14% appied pre-emergent to corn (Zea mays L.) sector on field plots of Hagerstown sitty clay loam (14% slope). Average losses for all rates in 1967 in runoff water and soil sediment equaled 2.4% and 0.16% of the total applied, respectively. In 1967, at the recommended rate (2.2 kg/ha) for preemergence applications to Pennsylvania soils, composite losses were 2.5% of the applied or approximately 0.05 kg/ha. In 1968, 1 yr after atrazine application, the average loss over all rates for the combined substrates was 0.01%. Analyses of soil core samples taken from all plots in 1967 revealed that 1 mo. after atrazine application an average of 67.9% remained in the soil, and 3 mo. later recoveries had decreased to 21.4% of that applied. The following year atrazine remaining in the soil had decreased to 15.9% in April and to 5.4% in Sept. At the recommended rate of application, recoveries decreased to 15.9% in April and to 5.4% in Sept. At the recommended rate of application, recoveries decreased from 39% of that applied to 9% for the same time period in 1967. In 1969, typical atrazine toxicity symptoms were found in oats growing on plots which had received 6.7 and 9.0 kg/ha of atrazine in 1967. Damage was confined to the up-permost parts of the slope.—Copyright 1973, Biological Abstracts, Inc. W73-13102

SOME ECOLOGICAL RELATIONSHIPS OF THE INVERTEBRATE DRIFT IN PRATERS CREEK, PICKENS COUNTY, SOUTH

CREEK, PICKENS COUNTY, SO CAROLINA, Oklahoma Univ., Norman. Dept. of Zoology. For primary bibliographic entry see Field 021. W73-13107

THE CONTROL OF PH AND TOTAL AL-KALINITY OR TOTAL CARBONATE IN AQUATIC BIOASSAYS, Michigan Univ., Ann Arbor. Dept. of Environ-mental and Industrial Health. For primary bibliographic entry see Field 05C.

Group 5B—Sources of Pollution

W73-13111

MOVEMENT FROM PHOSPHATE AGRICULTURAL WATERSHED DURING TWO RAINFALL PERIODS, Agricultural Research Service, Beltsville, Md. Soil

and Water Conservation Research Div. H. M. Kunishi, A. W. Taylor, W. R. Heald, W. J. Gburek, and R. N. Weaver. J Agric Food Chem. Vol 20, No 4, p 900-905. 1972.

Identifiers: *Phosphates, Rainfall, *Watersheds (Agricultural), *Path of pollutants.

The distribution of available phosphate between dissolved and adsorbed forms carried by stream water and sediments was measured at 2 sampling stations on a stream draining an agricultural watershed during high water flows. During an intense summer storm at the watershed the total available phosphate carried by the stream was 0.250 elbs. It is better the property of the property 0.762 g/ha. In a less intense spring storm the loss was 0.028 g/ha. Changes in phosphate concentration during the storms were interpreted in terms of the adsorption isotherms of the sediments, which show that material derived from subsoils and show that material derived from subsoils and stream banks has a large adsorption capacity. Concentrations of about 200 ppb (P) in water from ferile topsoil were reduced to less than 15 ppb as it moved downstream. Detailed prediction of phosphate concentrations in moving streams depends on adequate knowledge of the quantity, chemical characteristics, and origin of the sediment carried by the stream.—Copyright 1973, Biological Abstracts, Inc. W73-13115.

NITROGEN BALANCE IN SOIL COLUMNS IN-TERMITTENTLY FLOODED WITH SECONDA-RY SEWAGE EFFLUENT.

Agricultural Research Service, Phoenix, Ariz.

Water Conservation Lab.

J. C. Lance, and F. D. Whisler. J. C. Lance, and F. D. Whister.
J Environ Qual. Vol 1, No 2, p 180-186, 1972. Illus. Identifiers: Cation exchange, Dentrification, Effuents, Intermitt floodings, Microorganisms, "Nitrogen balance, Swage effluent, "Soils, Waste renovation, Water reuse, "Soil columns.

Short, frequent cycles of flooding soil columns (2 days flooded and 5 days dry) with seconda sewage effluent caused no net removal of N but transformed almost all of the N to nitrate. The net N removal during longer cycles (9-23 days flooded and 5 days dry) was 30%, and half of the N remaining in the water was concentrated into a wave of high-nitrate water, which represented 10% of the total volume of reclaimed water and was collected immediately after the dry period. Water collected from the columns after the wave of high-nitrate water passed contained 67% less N than the incoming sewage water. Alternate flooding and dry ing periods were necessary for consistent N removal. The net N removal was probably due to a combination of several reactions dominated by denitrification. Cation exchange was important in holding NH4+ in the soil until it could be nitrified, thereby concentrating N into smaller volumes of high-nitrate water. Denitrification is the logical reaction to investigate for higher net N removal because the soil microorganisms nitrified most of the NH4+ and N can be removed from the system as an inert gas by dentrification.--Copyright 1973, Biological Abstracts, Inc. W73-13116

STUDIES ON VIBRIO PARAHAEMOLYTICUS IN KOREAN COASTAL WATERS: I. THE DISTRIBUTION OF V. PARAHAEMOLYTICUS (IN

RUBERTON,
Pusan Fisheries Coll. (Republic of Korea).
W. J. Lee, W. K. Choe, and S. K. Chun.
Bull Korean Fish Soc. Vol 3, No 4, p 213-218. 1970. Illus. English summary.

Identifiers: Cephalopoda, Coasts, Crustacea, Distribution patterns, Fish food, *Korea coastal waters, Mud, Poisoning, Sea, Shellfish, *Vibrioparahaemolyticus.

The distribution of V. parahaemolyticus was studied in fish, shellfish, mud, Crustacea, sea water and Cephalopoda to determine possible origins of food poisoning in Korea. Of 517 samples obtained from mud, sea water, fish, Crustacea and Cephalopoda, 56 contained V. parahaemolyticus. Six strains were from mud samples, 7 from 44 sea water samples, 28 from 241 fish samples, 1 from 50 crustacean samples and 2 from 34 cephalopod samples. Seven strains were isolated from 48 samples in the Mokpo area and 2 were from 46 samples samples. Seven strains were stoated trom 46 samples in the Mokpo area and 2 were from 46 samples in the Pohang area. The number of strains in the Mokpo area and the number in the Pohang area were the highest and lowest, respectively.—Copyright 1973, Biological Abstracts, Inc. W73-13118

YELLOWSTONE NATIONAL PARK, BASELINE WATER QUALITY SURVEY RE-PORT.

Environmental Protection Agency, Kansas City, Mo. Region VII; and Environmental Protection Agency, Denver, Colo. Region VIII.

EPA Report, 1972, 115 p, 32 tab, 7 fig, 22 ref.

Descriptors: *Water quality standards, Pollutant identification, *Mountain watersheds, Water pollution sources, Oligotrophy, Data collections, Sewage effluents, *National parks, Lidentifiers: *Yellowstone National Park, Missouri River, Wyoming Yellowstone Lake

Water quality data obtained from the May 1970 to September 1970 investigation of the surface waters of Yellowstone National Park are sum-marized and evaluated. A brief description of climatic conditions, streamflows and past water stumanic conditions, streamflows and past water stu-dies is presented along with recommendations for actions to preserve and enhance existing condi-tions. Special appendices present detailed discus-sions of mine drainage in Soda Butte Creek, sewage treatment facilities evaluations, pesticide and radiological results and a summary of maners. and radiological results and a summary of ranges and means of chemical, and microbiological and pical data for park waters. (Keffer-EPA)

POLLUTION ABATEMENT PROGRAMS IN THE DELAWARE RIVER ESTUARY, Delaware River Basin Commission, Trenton, N.J. For primary bibliographic entry see Field 05G. W73-13164

THE GEOGRAPHIC DISTRIBUTION OF RESHWATER HIRUDINOIDEA IN CANADA, Calgary Univ. (Alberta). Dept. of Biology. R. W. Davies.

Canadian Journal of Zoology, Vol 51, No 5, p 531-545, May 1973. 1 tab, 70 ref, 1 append.

Descriptors: "Systematics, Aquatic animals, "Canada, "Annelids, "Speciation, "Spatial distribution, Animal groupings, Invertebrates. Identifiers: "Leeches, Macroinvertebrates, "Hiru-Identifiers: "Leeches, Macroinvertebrates, "Hirudinea, Cystobranchus verrilli, Illinobdella spp, Myzobdella moorei, Piscicola spp, Antinobdella spp, Batracobdella spp, Glossiphonia spp, Helobdella spp, Marvinmeyeria lucida, Placobdella spp, Theromyzon spp, Dina spp, Erpobdella spp, Moorebdella spp, Nephelopsis obscura, Bdellrogatis plumbeus, Hirudo medicinalis, Macrobdella decora, Mollibdella grandis, Percymoorensis

The distribution for each species of freshwater leech (Hirudinoidea) is described and discussed on a province or territory basis. The hosts for those species recorded as temporary parasites are listed.

One hundred and eight new species records are listed including 28 records new to the province or territory. Percymoorensis lateralis is recorded in Canada for the first time, and the first record of freshwater leeches in the Yukon is made. (Mortland-Rattelle) W73-13170

HYDROCARBONS IN THE PELAGIC SARGAS-SUM COMMUNITY,

NOM COMMUNITY, Woods Hole Oceanographic Institution, Mass. K. A. Burns, and J. M. Teal. Deep-Sea Research and Oceanographic Abstracts, Vol 20, No 2, p 207-211, February 1973. I fig, 2 tab, 14 ref.

Descriptors: *Chemical analysis, *Plant tissues, *Biological communities, Water sampling, Gas chromatography, Marine algae, Marine fish, Crustaceans, Food chains, *Organic compounds, Solvent extractions, Oil pollution, Absorption, Phaeophta, Marine animals, Crabs, Epiphytology, Invertebrates, Food webs, Pollutant identification. Identifiers: *Sargassum natans, *Animal tissues, Fingerprinting, Sample preparation, Petroleum hydrocarbons, Natural hydrocarbons, Pipefish, nydrocarbons, Natural nydrocarbons, Prpetisn, Biosynthesis, Stomach, n-Heptadecane, n-Pen-tadecane, Pentadecane, Heptadecane, n-Alkanes, Portunus sayi, Planes minuta, Histrio histrio, Syngnathus pelagicus, Canthidermis, Leander tenuiformis, Macroinvertebrates, Triggerfish, Pelagic animals.

Samples of pelagic Sargassum weed and as-sociated macrofauna were collected by dip-netting from ships using precautions against shipboard contamination described by Grice et al (1972). Before extraction, the plants were shaken free of animals and washed with pentane to remove surface contamination without disrupting the cells. These washings were analyzed to determine hydrocarbons adsorbed on the plant surface. Pentane-washed animals were gutted for stomach analysis, cut into small pieces, soxhele extracted with distilled methanol for 48 hr, and this lipid extract partitioned into acid-washed, sodium distilled ne. The pentane extract was concentrated, pentane. In pentane extract was concentrated, dried, purified on a 1:1 (vol:vol) column of alumina over silica gel, eluted and chromatographed on a 3 percent Apiezon L on Chromasorb W AW-DM CS) column. All the organisms appeared contaminated with petroleum hydrocarbons. There was no relation between the amount of natural, recently biosynthesized hydrocarbons in an organization of the control of the c ism and the amount of petroleum contamination. Animals had a larger ratio of petroleum to natural compounds than the Sargassum. There was no relation between the hydrocarbon content and the animals supposed positions in the food chain.

GEOTHERMAL MERCURY POLLUTION IN NEW ZEALAND,
Department of Scientific and Industrial Research,

Department of Scientific and Industrial Research, Lower Hutt (New Zealand). Chemistry Div. B. G. Weissberg, and M. G. R. Zobel. Bulletin of Environmental Contamination and Toxicology, Vol 9, No 3, p 148-155, March 1973. 2 fig, 2 tab, 14 ref.

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Descriptors: *Mercury, *Rainbow trout, *Brown Descriptors: Mercury, 'Rainoow trout, 'Brown trout, 'Bottom sediments, Chemical analysis, Water pollution, Lake sediements, Fluvial sediments, Water pollution sources, Heavy metals. Identifiers: 'New Zealand, 'Muscle, Reduction aeration technique, Flameless atomic absorption spectrophotometry, Sample preparation, Waikato River, Lake Rotorua, Lake Rotomahana, Lake River, Lake Rotorua, Lake Rotomahana, Lake Taupo, Lake Okareka, Lake Maraetai, Salmo trut-ta, Salmo gairdneri, Wet ashing, Animal tissues, Geothermal sources, Methylmercury.

In connection with the study of the magnitude and extent of natural mercury pollution arising from

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geothermal sources in New Zealand, rainbow and brown trout and sediments from the Waikato River lakes and some of the Rotorua lakes were River takes and some of the Kotorua lakes were analyzed for total mercury. A modified, stannous chloride reduction-aeration flameless AA technique, after wet ashing with nitric and sulfuric acids was used in the analysis. Check analyses, acias was used in the analysis. Check analyses, specific for methylmercury, were performed by gas chromatography on half of the trout samples. The results indicate much higher concentrations of mercury in trout living in waters receiving considerable geothermal discharges (Upper Waikato River, Lake Rotorua, and Lake Rotomahana) than in trout living in similar waters receiving little or no geothermal discharges (Lake Taupo and Lake Okareka). The concentrations of mercury in trout within a given lake increased with increasing fish weight, consistent with observations by others, and no distinct differences in mercury concentra-tions were observed between rainbow and brown trout, or between male and female trout of the same species, apart from the weight factor. The concentrations of mercury in sediments showed no apparent variation with increasing depth (i.e. age) of sediments. (Holoman-Battelle) W73-13175

EPOXIDATION AND FATE OF (C-14)ALDRIN IN INSECTICIDE-RESISTANT AND SUSCEPTIBLE POPULATIONS OF MOSQUITOFISH

Mississippi State Univ., State College. Dept. of

Zoology.

M. R. Wells, J. L. Ludke, and J. D. Yarbrough.

Journal of Agricultural and Food Chemistry, Vol

21, No 3, p 428-429, May/June 1973. 2 tab, 11 ref.

Descriptors: *Aldrin, *Animal metabolism, *Fish populations, *Bioassay, *Path of pollutants, Water pollution effects, Pesticide toxicity, Chlorinated hydrocarbon pesticides, Insecticides, Chemical analysis, Proteins, Killifishes, Laborato-

Chemical analysis, Proteins, Kindishes, Laboratory tests.

Identifiers: *Mosquitofish, Gambusia affinis,
*Fate of pollutants, *Detoxification, Epoxidation,
Thin layer chromotography, Animal tissues,
Liver, Brain, Sample preparation, Cleanup, Re-

One susceptible and two resistant populations of mosquitofish (Gambusia affinis) were treated with (C-14)aldrin to determine differences in aldrin etpoxidation between susceptible and resistant mosquitofish brains and livers. Three groups of nine fish from each population were tested in 5 ppb of (C-14)aldrin. The aldrin was shown by assay to contain 2.5 percent dieldrin. Three fish were removed from each group after 4-8 hr expo-sure, washed carefully, and tissue samples were extracted and homogenized. After protein determination, samples were extracted three times with hexane and twice for recovery of lipid-bound material in the brain with 3:1 chloroform-menthanol. Thin-layer chromotography samples were prepared from the remaining aqueous portion of the samples and were counted using a scintillation spectrometer. Resistant mosquitofish converted aldrin to dieldrin and/or water-soluble material at a greater rate than susceptible mosquitofish. These data would tend to support rate of detoxification as a possible mechanism of resistance to aldrin in the mosquitofish. (Mortland Rattelle)

ISOTOPHIC TRACER TECHNIQUES FOR IDENTIFICATION OF SOURCES OF NITRATE

POLLUTION, Tennessee Valley Authority, Muscle Shoals, Ala. Div. of Agricultural Development.

n

A. P. Edwards. Journal of Environmental Quality, Vol 2, No 3, p 382-387, July-September 1973. 4 tab, 25 ref.

Descriptors: *Tracers, *Path of pollutants, *Nitrates, Nitrogen, Radioisotopes, Fertilizers, Pollutant identification.

The use of labeled fertilizers with N-15 contents substantially higher or lower than the natural abundance figure is the only valid approach to the measurement of fertilizer contribution to the NO3 appearing in tile drains under field condition. The natural N-15 abundance approach to the measurement of percentage contribution of applied fertilizers to nitrate production was not successful in well-replicated laboratory incubation experiments. Time of incubation may be eliminated as a variable by incubating the control and fertilized samples by incubating the control and fertilized samples for the same time and under exactly the same conditions. (Knapp-USGS)

SALT PICKUP FROM AGRICULTURAL LANDS IN THE GRAND VALLEY OF COLORADO, Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering. G. V. Skogerbee, and W. R. Walker. Journal of Environmental Quality, Vol 2, No 3, p 377-382, July-September 1973. 7 fig, 3 tab, 7 ref.

Descriptors: *Water pollution sources, *Colorado River, *Salinity, *Path of pollutants, Return flow, Irrigation, *Colorado, Water pollution, Water quality, Salts. Identifiers: *Grand Valley (Colo).

Introduction of seepage and deep percolation losses to saline soils and aquifers, and the eventual return of these flows to the river system with their return of these flows to the river system with their parts of the sale when the sale of the sale when the sale of the sale when the sale of the sale when the sale of the sale when the sale of the sale when the sale of the sale when the sale of the sale when the sale of the large salt loads, make the Grand Valley in Colorado one of the more significant salinity sources in the Upper Colorado River basin. The sources in the Upper Colorado River basan. The principal components of both the water and salt flow systems were delineated, and water and salt budgets were generated on a monthly basis for the water years 1969-1971. About 31,039 metric tons of dissolved solids are being added from the small 1876 ha test area. This salt contribution of about 27.1 metric tons/ha is proportionate to the valley-wide pickup. From this analysis, it is concluded that salinity control alternatives must focus on reducing the flow of water in the groundwater system. Possible measures include conveyance channel linings and improved on-farm water management practices. (Knapp-USGS)

POLLUTION OF KARST AQUIFERS,

A. I. George. Water Well Journal, Vol 27, No 8, p 28-32, August 1973. 4 photo, 7 ref.

Descriptors: *Karst, *Land subsidence, *Water pollution sources, *Urban runoff, Sinks, *Kentucky, Karst hydrology, Urbanization, Urban hydrology, Path of pollutants, *Aquifers. Identifiers: *Bowling Green (Ky).

The city of Bowling Green, Kentucky is built entirely on top of the Sinkhole Plain, a karst area typified by few surface streams, total subsurface drainage through matter trunk cave passages, and a surface karst topography of sinkholes. With these conditions sinkholes collect urban runoff and transmit the polluted water vertically downward to lower trunk cave passages which are connected to surface springs of Barren River and Drakes Creek. Surface drainage characteristics are drastically altered by large shopping centers and commercial and industrial complexes with acres of pavement. The roofing-over of sections of the pavement. The roofing-over of sections of the Sinkhole Plain rechannels sheet runoff so that only a fraction of the total number of sinkholes that a fraction of the total number of sinknotes that previously received recharge still do so. This has put an abnormal strain on the whole hydrosystem. A higher base level is coupled with cave stream excavation of silt-filled passages that have not received active circulation since the Pleistocene glacial era. Because of this, roof-over actively promotes the development of catastrophic sinkholes. A 30-ft rise in the water level in the cave is common during high flow periods, and the cave can be expected to have an even higher flow and base level with continued roofing of the Sinkhole Plain. Cesspools, seepage pits, septic tanks, waste treatment plants, and ill-maintained municipal sewer lines are prime sources of viral-bacteriological and chemical contamination of water resources in a limestone terrain. (Knapp-USGS) W73-13203

LITERATURE SURVEY OF OCEAN POLLU-

A LITERATURE SURVEY OF OCEAN POLLU-TION, Catholic Univ. of America, Washington, D.C. Inst. of Ocean Science and Engineering. H. H. Shih.

Available from NTIS, Springfield, Va 22151 as AD-743 101 Price \$5.45 printed copy; \$1.45 microfiche. Report No 71-6, May 1971. 110 p, 18 fig, 9 tab, 386 ref. ONR Contract N00014-69-A-0432.

Descriptors: *Reviews, *Water pollution, *Oceans, *Sea water, Water pollution sources, Water pollution effects, Path of pollutants, Water pollution control. Identifiers: *Ocean pollution.

A survey of past studies on the problems of ocean pollution also identifies research areas in which there are notable deficiencies in knowledge. Available literature was surveyed for all phases of ocean pollution. A general description is given of ocean pollution of the world today. The chief pollutants, their sources, their effects, and the control of various types of ocean pollution are discussed. (Knapp-USGS)
W73-13211

GLUCOSE FLUX AT THE SEDIMENT-WATER INTERFACE OF TORONTO HARBOUR, LAKE ONTARIO, WITH REFERENCE TO POLLU-TION STRESS,
Toronto Univ. (Ontario). Dept. of Zoology.

L. W. Wood, and K. E. Chua. Canadian Journal of Microbiology, Vol 19, No 4, p 413-420, April 1973. 2 fig, 3 tab, 31 ref.

Descriptors: "Cycling nutrients, "Sediment-water interfaces, "Lake Ontario, "Water pollution effects, "Aquatic microorganisms, Water analysis, Lake sediments, Carbohydrates, Chemical analysis, Biochemistry, Methodology, Bottom sediments, Cores, Organic matter, Stress, Absorption. Identifiers: "Gucose, "Heterotrophy, "Nutrient flux, Fate of pollutants, Substrate concentration, Turnover time, Sugars, Substrate utilization, Catabolism.

Cycling of glucose at the sediment-water interface was determined through coupling measurement of natural substrate concentrations with heterotrophic uptake by the natural microbial communities in the sediment and in the water column. Freshly collected cores containing both a column. Freshly collected cores containing both a sample of the water column above the sediment-water interface as well as 20 cm of undisturbed benthic community were used for glucose analysis. The analysis for glucose followed the biochemical method of Hicks and Carey (1968). Determinations of betentrophy is unable to the column of the Determinations of heterotrophy in water were done by the methods of Wright and Hobbie (1966) as corrected for respiratory loss of C-1402 by Hob-bie and Crawford (1969). Determinations of aerobic heterotrophy in sediment were essentially the bic heterotrophy in sediment were essentially the same as those using water except that the added glucose (5-20 microliters) ranged from 27.5 to 102.5 micrograms/liter. The same general cycling pattern was found for both polluted and less polluted parts of Toronto Harbour, so that other labile organic species possibly have similar cycles. Velocity of uptake of glucose (flux) and turnover time showed no relationship to either substrate concentration or

Group 5B-Sources of Pollution

total organic matter of the sediments. Activity in the water column could be supported to a major extent by sediment export of substrate by turbulent diffusion. Sediment activity must be sup-ported by particulate sedimentation and hydrolysis of large organic molecules, which may be aided by the macrobenthic community. Pollution stress ap-parently alters the catabolism of the substrate. The observed substrate concentrations may reflect a minimum of residual concentration, below which the microbial community has difficulty in taking up the substrate. (Holoman-Battelle) W73-13236

EVIDENCE FOR BUFFERING OF DISSOLVED

SILICON IN FRESH WATERS, University of East Anglia, Norwich (England). School of Environmental Sciences.

A. M. C. Edwards, and P. S. Liss. Nature, Vol 243, No 5406, p 341-342, June 1973. 18

Descriptors: Freshwater, *Temporal distribution, *Spatial distribution, *Variability, Chemical reac-tions, Dissolved solids, Laboratory tests, Soils, Soil water, Chemical analysis, Water analysis, Identifiers: Dissolved silicon, *Silicon, *Buffers,

Documented studies are presented which illustrate the low temporal and spatial variability found for dissolved silicon levels in freshwater. Sorption reactions involving dissolved silicon and solid phases are posed as the more likely buffer mechanism responsible for controlling the concentration of dissolved silicon in rivers, lakes and soils. (Holoman-Battelle) W73-13238

EFFECT OF DYES ON BACTERIAL GROWTH. Pennsylvania State Univ., University Park. Dept.

of Microbiology.
D. Y. C. Fung, and R. D. Miller.
Applied Microbiology, Vol 25, No 5, p 793-799, May 1973. 5 tab, 8 ref.

Descriptors: *Dyes, *Growth rates, *Analytical techniques, *Aerobic bacteria, *Pollutant identification, Bioindicators, Cultures, Separation techniques, Methodology, Water pollution effects,

Identifiers: Pollutant effects, *Bacterial physiology, Gram-positive bacteria, Gram-negative bacteria, Culture media, Tryptic soy broth, Alcaligenes faecalis, Enterobacter spp, Proteus vulgaris, Pseudomonas aeruginosa, Salmonella spp, Shigella flexneri, Serratia marcescens, Bacillus spp, Gaffkya tetragena, Micrococ rhodochrous, Sarcina lutea, Streptococcus spp.

A rapid screening procedure was used to test the effect of 42 different dyes on the growth of 30 bac-teria on solid media. Stock solutions of each dye were incorporated into a tryptic soy agar at final dilutions of 1:1000, 1:10,000, and 1:100,000 before sterilization of the media at 121C for 15 minutes. A multipoint inoculation device was used to transfer broth culture of the test organisms onto the agar surface. The agar plates were inverted for incuba-tion at 37C for 24 and 48 hr. They were observed under incandescent as well as ultraviolet light and growth was recorded as positive or negative after 24-and 48-hr periods. The results indicated that many readily available dyes might have potential ication for selective isolation of specific bacterial groups as well as value in differentiating between closely related bacterial taxa. Separation of Enterobacter from Escherichia, Salmonella from Shigella, and Staphylococcus from Micrococcus by selected dyes was also evaluated. (Mortland-Battelle) METABOLISM OF NITRILOTRIACETATE BY CELLS OF PSEUDOMONAS SPECIES.

Michigan State Univ., East Lansing. Dept. of Crop and Soil Sciences J. M. Tiedje, B. B. Mason, C. B. Warren, and E. J.

Applied Microbiology, Vol 25, No 5, p 811-818, May 1973. 4 fig, 4 tab, 25 ref.

Descriptors: "Nitrilotriacetic acid, "Psudomonas, "Pollutant identification, "Metabolism, "Microbial degradation, Soil bacteria, Surfactants, Aerobic bacteria, Detergents, Cytological studies, Chemical analysis, Gas chromatography, Biodegradation, Cultures, Ammonia, Volumetric analysis, Radioactivity techniques. Identifiers: "Fate of pollutants, "Degradation products, Substrate utilization, Scintillation countries."

products, Substrate utilization, Scintillation counting, Manometric studies, Culture media, Liquid scintillation, Batch cultures, Aspartate, Glycine, Aconitate, Iminodiacetate, Glyoxylate, Sarcosine, Acetates, N-methyliminodiacetate.

A Pseudomonas species was isolated from soil which could degrade nitrilotriacetate (NTA) to CO2, H20, NH3, and cellular constituents without the accumulation of significant quantities of intermediates either in the presence or absence of several inhibitors. After extensive gas chromatog-raphy analysis, small quantities of aspartate, glycine, and aconitate were the only detectable compounds to accumulate during NTA degradation, and these compounds were not excreted from the cells. Manometric studies indicated that intermediates, whereas N-methyliminodiacetate, sarcosine, and acetate are not. The data are consistent with an oxidative cleavage of the C-N bond of NTA as the initial degradation step. The finding that NTA is readily oxidized to inorganic products and that no intermediates accumulated under a variety of conditions indicates that environmental concern for hazardous intermediates in NTA degradation seems unwarranted. (Mortland-Battelle) W73-13244 iminodiacetate, glycine, and glyoxylate are possi

CADMIUM TOXICITY AND ACCUMULATION

IN SOUTHERN NAIAD, Oklahoma Univ. Health Sciences Centrolled City. Dept. of Environmental Health. For primary bibliographic entry see Field 05C. W73-13251

METABOLISM METHANOL. IN PSEU-DOMONAD C, Hadassah Medical School, Jerusalem (Israel)

For primary bibliographic entry see Field 05C. W73-13256

METABOLISM OF ENDOTHALL BY AQUATIC

METABULISM OF MICROORGANISMS, Svracuse Univ. Research Corp., N.Y. Life For primary bibliographic entry see Field 05C. W73-13258

COLIFORMS, FECAL COLIFORMS, AND FECAL STREPTOCOCCI AS INDICATORS OF FECAL STREPTOCOCCI AS INDICATOR: WATER POLLUTION, Hadassah Medical School, Jerusalem (Israel). J. Cohen, and H. I. Shuval.

Water, Air, and Soil Pollution, Vol 2, No 1, p 85-95, March 1973. 5 fig, 3 tab, 23 ref.

Descriptors: *Coliforms, *Bioindicators, *Viruses, *Water pollution, Sewage treatment, Treatment facilities, Potable water, Lakes, Rivers, Chlorination, Efficiencies, Enteric bacteria, Pathogenic bacteria, Springs, Water wells, Water

sampling, Biological treatment. Identifiers: *Fecal coliforms, *Fecal streptococci, *Fecal pollution, Pollutant removal, Survival, Lake Kinneret, Culturing techniques, Culture

The presence and survival of coliforms fecal coliforms, and fecal streptococci were studied under various ecological conditions (sewage treatment plants, heavily polluted rivers, a lake and other drinking water sources) and their relative importance as pollution indicators, especially of viral pollution, was examined for each type of water system examined. Grab samples were taken with sterile containers, filtered, and the bacteria were cultured. Coliform bacteria were cultured on m-Endo media (Difco) and counted after 24 hr incun at 35 C. Fecal coliforms were incubated on M-FC broth (Difco) for 24 hr in a water bath at 44.5 C. Fecal streptococci were incubated for 4 hr at 35 C followed by 44 hr at 44.5 C to eliminate the growth of atypical microcolonies. In all cases the fecal streptococci were generally more resistant to tecal streptococci were generally more resistant to the natural water environment and to purification processes than the other indicator organisms and, at points distant from the original source of pollu-tion were often the only indicators of the fecal na-ture of the pollution. In two of the systems studied the survival of the fecal streptococci paralleled the survival of enteric viruses better than the coliforms. The fecal streptococci may thus in certain cases provide a better estimate of the probable virus content in lightly contaminated water than the other two indicators. (Holoman-Battelle) W73-13262

DISTRIBUTION AND BACKGROUND LEVELS OF MERCURY IN SEDIMENT CORES FROM SELECTED WISCONSIN LAKES,

Wisconsin Univ., Madison. Dept. of Soil Science. J. K. Syers, I. K. Iskandar, and D. R. Keeney. er, Air, and Soil Pollution, Vol 2, No 1, p 105-118, March 1973. 5 fig, 2 tab, 36 ref.

scriptors: *Mercury, *Cores, *Lake sedim *Pollutant identification, Spatial distribution, *Wisconsin, Hydrogen ion concentration, Heavy metals, Soil analysis, Chemical analysis, Deep water, Shallow water, Hardness (Water), Bottom

sediments, Aquatic soils, Dredging.
Identifiers: *Flameless atomic absorption specidentifiers: "Flametess atomic absorption spec-trophotometry, "Vertical distribution, Sample preparation, Organic carbon, Lake Mendota, Lake Minocqua, Lake Monona, Lake Wanbesa, Lake Kegonsa, Lake Wingra, Lake Mary, Lake Crystal,

The vertical distribution of Hg in sediment cores from a range of hard-and soft-water lakes in Wisconsin was evaluated in terms of potential sources of Hg during the nineteenth and twentieth centuries. Core samples were collected in the winter of 1970-1971 from deep-water areas from each lake and two cores were also taken from shal-low water areas in Mendota and Minocqua. Cores were sectioned at 5-cm intervals and transferred to nsed glass bottles. Surficial sediments were collected with an Ekman dredge. The samples were stored at 4 C and analyzed within a week post collection. Total Hg was determined on undried collection. Total Hg was determined on undried samples by wet digestion with H2S04/HN03 and subsequent flameless atomic absorption spec-trophotometry. A sub-sample was freeze dried and used for the determination of organic C, free iron oxides extractable with citrate-dithionite-bicar-bonate, and CaCO3. The pH of undried samples was measured with a glass electrode. All results were expressed on an oven-dry basis. For the Madison lakes, the trends in Hg distribution were related to variations in sewage inputs during the last 80 yr. It is unlikely that either inputs of sewage or erosional products are responsible for the ob-served accumulation of Hg in the most recent sedients from three lakes in northeastern Wisconsin Background levels varied from 0.01 to 0.24 ppm of act sediment basis) in precultural sed from the Wisconsin lakes investigated. There was no consistent relationship between the concentration of Hg and other sediment components of

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WATER QUALITY MANAGEMENT AND PROTECTION—Field 05

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potential importance in the retention of Hg. (Holoman-Battelle) W73-13264

UPTAKE AND ACCUMULATION OF DDT AND PCB BY EPHEMERA DANICA (EPHEMEROP-TERA) IN CONTINUOUS-FLOW SYSTEMS, Lund Univ. (Sweden). Dept. of Zoology. For primary bibliographic entry see Field 05C. W73-13265

METHYLMERCURY: BACTERIAL DEGRADA-TION IN LAKE SEDIMENTS, Midwest Research Inst., Kansas City, Mo. W. J. Spangler, J. L. Spigarelli, J. M. Rose, and H. M. Miller. Science, Vol 180, No 4082, p 192-193, April 13, 1973. 3 fig, 11 ref.

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Descriptors: "Microbial degradation, "Lake sediments, "Aquatic bacteria, "Mercury, Pseudomonas, Cultures, Biodegradation, Mass spectrometry, Michigan, Heavy metals, Pollutant

trometry, Michigan, Heavy metals, Pollutant identification.

Identifiers: *Methylation, *Methylmercury, *Fate of pollutants, Pure cultures, Volatilization, St. Clair River, Mixed cultures, Degradation products, Substrate utilization, Organomercury compounds, Organometallics, Methane, Flame ionization gas chromatography, Electron capture gas chromatography.

Long-term incubation studies were carried out on the biomethylation of mercury in sediments taken from the delta area of the St. Clair River, Michigan. Various combinations of growth media and gaseous atmospheres were used in an effort to Michigan. Various combinations of growin media and gaseous atmospheres were used in an effort to identify organisms or groups of organisms capable of methylating Hg. During the first 50 days of a long-term period of incubation of lake sediments with inorganic mercury (Hg (2 plus)), low concentrations of methylmercury were observed to build up. Upon continued incubation there was a rapid decrease in amount of methylmercury in the system and a concomitant evolution of volatile incursaries mercury (Hz). Transfer of the mixed culsystem and a concomitant evolution of volatile in-organic mercury (Hg). Transfer of the mixed cul-ture to growth media containing methylmercury resulted in the degradation of methylmercury and the volatilization of Hg. Four bacterial isolates were obtained from the mixed culture which, in pure culture, rapidly degraded methylmercury to methane and Hg. The presence of methane in head space gases was confirmed by flame ionization gas chromatography, and the presence of He in head chromatography, and the presence of Hg in head space gases was confirmed by mass spectrometry. (Homoman-Battelle) W73-13267

SULPHATE DEPOSITION BY PRECIPITATION INTO LAKE ONTARIO, Atmospheric Environment Service, Toronto (On-

tano). R. W. Shaw, and D. M. Whelpdale. Water, Air, and Soil Pollution, Vol 2, No 1, p 125-128, March 1973. 2 tab, 7 ref.

Descriptors: *Sulfates, *Water pollution sources, *Precipitation (Atmospheric), *Snowfall, *Lake Ontario, Chemical analysis, Specific conductivity, Time, Hydrogen ion concentration, Sampling, Pol-Identifiers: *Fate of pollutants.

Samples of falling precipitation were collected three times at eleven sites along western Lake Ontario. Care was taken that the sampling was done during periods of prolonged, continuous precipitation and also that the collectors (suitably cleaned substitution and also that the collectors (suitably cleaned substitution and also that the collectors (suitably cleaned suitable suita not and also that the conceives saturacy tecanics polyethylene pails) were set out and taken in within approximately 1 hr of the beginning and end of the precipitation, from individual snow storms of several hours duration indicate that approximately 9-66 mg/sq m of sulfate is being deposited per storm. Using a mean sulfate concentration in precipitation in this region (throughout the year) of 4 mg/l and an annual accumulation of precipitation of 760 mm, the total annual deposition of sulphate by precipitation alone is almost 3 g/sq m, or a total of 4,000 metric tons over the western end of the Lake. The annual deposition of sulfate by precipitation is, therefore, about 0.1 percent of the total mass of sulfate. This is significantly of the same order of magnitude as that discharged directly into the Lake by industry. (Holoman-Battelle) W73-13270

PERSISTENCE OF VIRUS AND BACTERIA IN

SEAWATER, California Univ., Berkeley. School of Public For primary bibliographic entry see Field 05C. W73-13272

CHLORINATED HYDROCARBONS IN PLANK-TON FROM THE GULF OF MEXICO AND NORTHERN CARIBBEAN, Texas A and M Univ., College Station, Dept. of

Chemistry. C. S. Giam, M. K. Wong, A. R. Hanks, W. M. Sackett, and R. L. Richardson.
Bulletin of Environmental Contamination and Toxicology, Vol 9, No 6, p 376-382, June 1973. 2 fig, 1 tab, 15 ref.

Descriptors: "Plankton, "Polychlorinated biphen-yls, "DDT, Chlorinated hydrocarbon pesticides, Sampling, "Gulf of Mexico, Chemical analysis, Solvent extractions, Pollutant identification, Marine animals, Marine plants, Zooplankton, Phytoplankton, Sea water. Identifiers: "Metabolites, "Caribbean Sea, Elec-tron, caretter, ease, chromatography."

tron capture gas chromatography, Sample preparation, Aroclor 1242, Aroclor 1248, Aroclor 1254, Aroclor 1260, Detection limits.

During 1971 and 1972 a baseline study of pollutants in the open Gulf of Mexico and Northern Caribbean, sponsored by the International Decade Ocean Exploration, was conducted. Plankton samples were collected over extensive areas of the Gulf of Mexico and Northern Caribbean. The san ples were analyzed by electron capture gas chromatography for DDT, its metabolites and PCBs, in order to determine the concentration and distribution of these contaminants in the lowest levels of the marine food chain. From the results, it appears the marine food chain. From the results, it appears that DDT's and PCB's are widely spread but at a low level. There were few discernible geographic trends in the sampled areas. About 70 percent of the samples gave higher PCB than DDT values. No definite trend can be observed from the PCB/DDT ratio of the samples analyzed. Generally, the total DDT and PCB levels in plankton samples is comparable to that in small whole fish and muscle of some larger fish. (Holoman-Battelle) W73-13273

COMPARATIVE EXTRACTION OF CHLORINATED HYDROCARBON INSECTI-CIDES FROM SOILS 20 YEARS AFTER TREAT-MENT,

Agricultural Research Service, Beltsville, Md. Agricultural Environmental Quality Inst. R. G. Nash, W. G. Harris, P. D. Ensor, and E. A.

Journal of the Association of Official Analytical Chemists, Vol 56, No 3, p 728-732, May 1973. 8 tab, 14 ref.

Descriptors: *Soil analysis, *Pesticide residues, *Chlorinated hydrocarbon pesticides, Aldrin, Dieldrin, Endrin, Heptachlor, DDT, Separation techniques, Gas chromatography, Statistical methods.

Identifiers: *Shake extraction, *Soxhlet extrac-tion, Column extraction, Isodrin, Chlordane, Tox-aphene, BHC, Delan, Heptachlor epoxide,

Nonachlor, Lindane, Sample preparation, Gas liquid chromatography, Endrin ketone, Endrin al-cohol, Endrin aldehyde, Organic solvents,

Three methods, shake, Soxhlet, and column, were compared for efficiency of extraction of certain chlorinated hydrocarbon insecticides from a Congaree sandy loam soil which had been treated 20 years earlier. Column extraction had a tendency to be less efficient than the other 2 methods, but statistically there were no differences in extraction efficiences among the 3 methods for aldrin, dieldrin, heptachlor, chloradane, isodrin, endrin, toxaphene, or Dilan and their residue products. However, shake extraction was significantly more efficient for the BHC isomers than Soxhlet extraction and the latter was significantly more efficient than column extraction. (Little-Battelle)

ECOLOGY OF TWO RELATED SPECIES OF CADDIS FLY LARVAE IN THE ORGANIC SUB-STRATES OF A WOODLAND STREAM, McGill Univ., Montreal (Quebec). Dept. of Biolo-

gy. R. J. MacKay, and J. Kalff. Ecology, Vol 54, No 3, p 499-511, Late Spring 1973. 5 fig, 9 tab, 30 ref.

Descriptors: "Caddisflies, "Larvae, "Organic matter, Ecology, "Aquatic habitats, "On-site tests, "Laboratory tests, Detritus, Leaves, Natural streams, Animal populations, Niches, Aquatic in-sects, On-site investigations, Invertebrates, Water

sampling.

Identifiers: *Woodland stream, *Substrate utilization, Food sources, Surber sampler, Sample
preservation, Pcynopsyche luculenta, Pycnopsyche gentilis, West Creek, Substrates,
Macroinvertebrates, Detritivores, Sympatric spe-

Two species of Pycnopsyche larvae inhabiting al-lochthonous organic materials in West Creek are contemporaneous and similar in size. Field studies and laboratory experiments show that about 90% of P. gentilis larvae live in fallen leaves, which they use as food and for case materials; the of P. gentilis larvae live in fallen leaves, which they use as food and for case materials; the remaining 10% occur in detritus with P. luculenta. P. luculenta can utilize leaves or woody materials; 50% of the population is in detritus, and 50% is in more leafy habitats, but not far from detritus. The distribution of each species from September through March depends on the amount of preferred habitat space available. Larvae in leafy habitats are washed downstream during the spring thaw by habitat displacement. In 1971, two-thirds of the P. gentilis population and nearly half the P. luculenta population were displaced. The subsequent shortage of leafy habitat space and crowding of remaining larvae may result in competitive interaction and predation by grackles. In the laboratory, both species feed preferentially on leaves that decay quickly, especially on leaves infected with fung. Dry weights of leaf tissue ingested per larva in 24 hours frequently exceed 50% of the dry body weight of the larva. P. luculenta ingests less leaf material if twigs are available. The niche size of P. gentilis is smaller than that of the P. luculenta. There is some niche overlap, but it apparently does not normally result in harmful competition between the species. (Mortland-Battelle) W73-13286

NITROGEN METABOLISM IN THE SEA. Lamont Geological Observatory, Palisades, N.Y.

Available from the National Technical Informa-tion Service as COO-3222-2, \$3.00 in paper copy, \$1.45 in microfiche. Technical Progress Report, October 31, 1972. 249 p. 20 fig. 14 tab. 9 ref, 3 ap-pend. Contract No AEC-AT (11-1)3222.

Group 5B-Sources of Pollution

Descriptors: "Radioactivity techniques, "Nitrogen, "Phytoplankton, "Zooplankton, "Metabolism, Sea water, Primary productivity, Water quality, Sampling, Systematics, Nets, Sieves, Nitrates, Nitrites, Ammonia, Silicates, Dissolved oxygen, Hydrogen ion concentration, Water temperature, Salinity, Alkalinity. Dissolved oxygen, Hydrogen ion concentration, Water temperature, Salinity, Alkalinity, Nutrients, Carbon, Cultures, Copepods, Dinoflagellates, Phosphates, Food chains, Absorption, Cycling nutrients, Amphipoda, Marine algae, Protozoa, Invertebrates, Marine animals, Crustaceans, Larvae, Mollusks, Gastropods, Diatoms.
Identifiers: N-15, Pteropods, Chaetognaths, Ap-

pendicularia, Siphonophores, Medusa, Euphausiids, Macroinvertebrates, Coelenterates, Tunicates, Nitrogen radioisotopes, Decapods, Coccolithophores, Sample preservation, On board analysis, Chaetocero simplex, Monochrysis lutheri, Coccolithus huxleyi, Artemia salina.

A combination of daily measurement of standing stocks and rates derived from N-15 uptake experiments was used in determining rates of nitrogen flux during the initial stages of the annual increase in productivity at a station off Bermuda. The ogen flux during the first stage of the annual nitrogen cycle was chosen for examination. Sam-ples were collected daily for a period of three weeks. Standing stock measurements of all par-ticulate nitrogen from 0.45 - 10,000 microns were made on samples collected with water bottles and plankton nets. Measurements of dissolved inorganic nitrogen, other nutrients, salinity, a game murogen, other nutrients, samity, and tem-perature were made on samples taken with water bottles equipped with reversing thermometers. Three preliminary experiments were done with N-15-labeled phytoplankton to measure the rate of nitrogen transfer from primary producers to her-bivores. A program was initiated to collect and maintain conclusions of the continuation of intain zooplankton cultures for continuation of N-15 tracer studies under laboratory conditions. It was concluded that both methods should be used to understand the nitrogen flux in an ecosystem. The standing stock method is at the lower limits of its sensitivity when production and changes in standing stock are small. The N-15 method may be used more successfully under such conditions. (Mortland-Battelle) W73-13292

A REPORT ON BACTERIAL POLLUTION AF-PECTING SHELLFISH HARVESTING IN NEW-PORT RIVER, NORTH CAROLINA. Environmental Protection Agency, Athens, Ga. Surveillance and Analysis Div.

Available from the National Technical Information Service as PB-215 291, \$3.00 in paper copy, \$1.45 in microfiche. Report, April 1972. 43 p, 10 fig, 11 tab, 11 ref, 2 append. fig, 11 tab, 11 ref, 2 apper

Descriptors: *Water pollution effects, *Water Descriptors: "Water pollution effects, "Water quality standards, "Water analysis, "Water pollution sources, "Shellfish, "Shellfish farming, Tributaries, Domestic wastes, Waste disposal, Coliforms, Treatment facilities, Estuaries, Waste water treatment, E. Coli, Chlorination, Water sampling, Bioindicators, Biochemical oxygen demand, Suspended solids, Carbon, Nitrogen, Organic matter, Dyes, Soil analysis, Water pollution, Water quality, Septic tanks, Chlorine, Enteric bacteria, Sediments, Chlorides, Phosphorus, Chemical oxygen demand, "North Carolina. Identifiers: "Newport River (NC), Fecal coliforms, Fecal pollution, Fecal streptococci,

cal oxygen demand, "North Carouna. Identifiers: "Newport River (NC), Fecal coliforms, Fecal pollution, Fecal streptococci, Grease, Salmonella bredeney, Salmonella reading, Salmonella anatum, Salmonella muenchen.

An intensive bacteriological monitoring program has been conducted in shellfish harvesting areas of the Newport River in North Carolina. Levels of bacterial indicators in the river's estuary and tributaries are reported and where possible, sources of the indicators are identified. Two treatment plants were major domestic waste sources but it was determined that if they operated continuously at the same efficiency as during the study they did not pose an immediate threat to shellfish growing areas. Other sources of contamination identified were wildlife, agricultural runoff, and septic tanks. In those areas of the River classified for shellfishing, each station monitored was in violation of the established criteria of the USPHS standard (medi-an total coliform not to exceed 70/100 ml and not more than 10 percent exceed an MPN of 230/100 ml). (Mortland-Battelle)

LITERATURE PERTAINING TO WATER QUALITY AND QUANTITY IN UNSATURATED

POROUS MEDIA, Arizona Univ., Tucson. Dept. of Hydrology and

Water Resources.
A. K. Tyagi.
Technical Report No. 9, 1972, 125 p, 261 ref.
OWRR B-020-ARIZ (1). 41-31-0001-3555.

Descriptors: Moisture, *Unsaturated flour, *Porous media, Theoretical analysis, *Reviews, Numerical analysis, Dispersion, *Water quality, Numerical analysis, Dispersion, *Water que Finite element analysis, Hydraulic conduct *Bibliographies, *Path of pollutants, moisture.

Identifiers: Dispersion coefficient, *Unsaturated

The available literature is reviewed in two parts -the movement of water in unsaturated soils and the investment of water in unsaturated sous and the simultaneous transfer of water and pollutants in unsaturated soils. Papers pertain to theoretical analysis, laboratory study, and field work on the two problems. An appendix lists the references, categorizing the kinds of study by various in-vestigators. W73-13302

THE ROLE OF PAPER MILL ADDITIVES AS POTENTIAL STREAM POLLUTANTS, Washington State Univ., Pullman. Coll. of En-

wasnington State Univ., Pullman. Coll. of Engineering.
J. C. Sheppard.
Available from NTIS, Springfield, Va., as RLO-2221-T-3-3; \$4.00 in paper copy, \$1.45 in microfiche. Report RLO-2221-T-3-3, Feb. 1973. 33 p, 15 fig, 1 tab, 4 ref. AEC-AT (45-1)-2221 Task 3.

Descriptors: *Pulp wastes, *Pulp and paper industry, *Neutron activation analysis, *Environmental effects, Sedimentation basins (Waste disposal), Zinc, Titanium, Water pollution sources, Organic compounds, Carbon radioisotopes, Tracers, Radioisotopes, Radioactivity techniques, Ef-fluents, Path of pollutants.

Neutron-activation analysis was used in determining the fate of TiO2 and ZnO in an operating paper mill. Analysis of low levels of Ti in the effluents indicated that most Ti was recycled before reaching the final clarifier. Clay filler bleached with Zn hydrosulfite retained the Zn such that e Zn was not present in the effluent. The use soluble Zn was not present in the effluent. Inc use of C14 labelling to trace organic additives is suggested since attempts to tag them with metal ions were found to have limitations. A microtome-sectioning, neutron-activation method was used to determine the distribution of additives in paper, minary experiments indicated th conjunctive use of ion-scattering at paper surfaces may be useful. Analysis of paper for clay filler using an (Am241)-Be source was not better th the conventional ashing method. (Bopp-ORNL) W73-13338

TERRESTRIAL PLANT ECOLOGY. Battelle-Pacific Northwest Labs., Richland, Wash. Ecosystems Dept.

Available from NTIS, Springfiled, Va., as BNWL-1970, Vol. 1, Pt. 2; \$4.00 paper copy, \$1.45

microfiche. In: Report BNWL-1750, Vol 1, Pt 2, March 1973, Section 7. 11 p, 4 fig, 5 tab, 20 ref.

Descriptors: *Grasslands, *Semiarid climates, Descriptors: "Grasssands, "Semiand climates, *Water utilization, "Fertilization, Forecasting, On-site data collections, Cycling nutrients, Ab-sorption, Phosphorus, Phosphorus radiosiotopes, Sulfur, Hydrogen ion concentration, Soil con-tamination, Radioactivity, Lysimeters, Nuclear wastes, Ecology, Radioecology, Plant growth,

Soil disturbances from wildfires or radioactive-waste burial tend to be stabilized by cheatgrass colonization. Cheatgrass appears to be more effi-cient in utilizing soil water and nutrients than the native safegrass and bunchgrass. Data collected over 4 yr permits predicting the effect of nitrogen fertilizer on cheatgrass growth as a function of the moisture, nitrate, and ammonia present in the soil. The soil in the vicinity of the canopy spread of the shrub halophyte greasewood is enriched in sodium by leaf drop, also in P and S, and the pH is increased. These changes reduced uptake of Zn65, P32, and S35 by barley shoots but did not affect uptake of Ca45. Small lysimeters were used to study water use by herbage. (Bopp-ORNL) W73-13340

FRESHWATER ECOLOGY.
Battelle-Pacific Northwest Labs., Richland,
Wash. Ecosystems Dept.

Report available from NTIS, Springfield, Va., as BNWL-1750, Vol. 1, Pt. 2; \$4.00 in paper copy, \$1.45 microfiche. In: Report BNWL-1750, Vol 1, Pt. 2, March 1973, Section 6. 26 p. 10 fig., 10 tab, 11

Descriptors: *Radioactivity effects, *Tritium, Descriptors: "Radioactivity effects, "Intuin, Absorption, "Thermal pollution, Freshwater fish, Invertebrates, Algae, Rainbow trout, Radioecology, Food chains, Food webs, Nuclear wastes, Infection, Fish diseases, Organic compounds, Path of pollutants, Water pollution effects.

Uptake of tritium from 1 microCurie/liter of tritiated water solution reached a maximum in about 5 months in tissues of most aquatic organisms. Organically bound tritium was 7-21% of the total in mussel, crayfish, carp, and filamentous algae; 4-12% in emergent vegetation. One month after termination of the experiment, only trace activities were measured in most tissues, but 30-40% of their label was retained by filamentous algae and emergent vegetation; after 8 months, 10% was retained by vegetation. In continuing studies on (sublethal) effects of chronic low-level irradiation, the immune capacity of juvenile and yearling rain-bow trout against a naturally occurring bacterial antigen was suppressed following tritium irradia-tion during embryogenesis. Combined effects of temperature and other environmental stresses on fish and invertebrates were studied. (Bopp-ORNL) W73-13341

CHARACTERISTICS OF HANFORD SOIL AND AQUATIC SEDIMENTS.

Battelle-Pacific Northwest Labs., Richland, Wash. Ecosystems Dept.

Report available from NTIS, Springfield, Va., as BNWL-1750, Vol. 1, Pt. 2; \$4.00 in paper copy, \$1.45 microfiche. In: Report BNWL-1750, Vol 1, Pt.2, March 1973, Section 5.6 p., 2 fig, 14 ref.

Descriptors: *Mercury, *Water analysis, *Suspended solids, *Soil-water-plant relationships, Path of pollutants, Columbia River, sinps, ratio in politicatins, Columbia Arver, Seasonal, Grasslands, Grazing, Mathematical models, Forecasting, Soil moisture, Soil tempera-ture, Carbon cycle, Carbon dioxide, Soil gases, Thermal pollution, Water pollution, Runoff.

WATER QUALITY MANAGEMENT AND PROTECTION—Field 05

Sources of Pollution—Group 5B

Spring grazing over a 2-year period reduced carbon dioxide evolution from soil, probably by reduction of root respiration. A preliminary model correlated seasonal changes in carbon dioxide evolution with soil temperature (20 cm) and soil moisture (0-8 cm), both for grazed and ungrazed soils. Hg in water and suspended matter from the Columbia River and its tributaries was measured over a one-way period. Hg in suspended matter. Cotumbia River and its tributaries was measured over a one-year period. Hg in suspended matter was highest during the winter periods of relatively low-water levels and minimum terrestrial runoff. Concentrations in sediments behind dams were lower than in suspended matter from the same locations. (Bopp-ORNL) W73-13342

MARINE SCIENCES.

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Report available from NTIS, Springfield, Va., as BNWL-1750, Vol. 1, Pt. 2; \$4.00 in paper copy, \$1.45 microfiche. In: Report BNWL-1750, Vol 1, Pt.2, March 1973, Section 3.8 p., 5 fig, 4 tab, 10 ref.

Descriptors: *Thermal pollution, *Radioactivity effects, *Marine fish, *Oysters, Fish eggs, Tritium, Effluents, Washington, Estuarine environment, Pacific Coast Region, Lethal limit, Oceanography, Trace elements.

Effects from canal discharge of powerplant cooling water were assessed in two types of experiment: (1) Lethal temperature were determined (28-31 degrees) for various rates of heating of marine fish (0.2-2 degrees/min) collected near shore and acclimated to 10 degrees, and (2) lethal exposure times (10-100 min) were determined at 26-30 degrees. Oyster eggs were exposed for 48 hr in seawater containing 0.01-1 microCurie/ml of tritium (the calculated dose was 0.0038-0.54 rads). There was no effect on egg development. Participation in the Geochemical Ocean Sections Study is reviewed. (Bopp-ORNL)
W73-13343

PLUTONIUM STUDIES.
Battelle-Pacific Northwest Labs., Richland,
Wash. Ecosystems Dept.

Report available from NTIS, Springfield, Va., as BNWL-1750, Vol. 1, Pt. 2; \$4.00 in paper copy, \$1.45 microfiche. In: Report BNWL-1750, Vol 1, Pt., March 1973, Section 2. 8 p., 1 fig, 3 tab, 5 ref.

Descriptors: *Nuclear wastes, *Vegetation, *Absorption, *Food chains, Public health, Path of polsorpuon, "Food chains, ruonic neatin, rain of poi-lutants, Monitoring, Soil bacteria, Chelation, Soil fungi, Soil microorganisms, Actinomycetes, Cytological studies, Soil contamination, Nevada, Organic compounds, Analytical techniques, Radioactivity techniques, Anaerobic bacteria, Sampling, Optimization, Statistics.

Sampling designs were formulated to inventory soil for Pu at Enewetok Atoll and the Nevada Test Site. Complexing with processing chemicals generally increased uptake of Nevada-Test-Site vegetation from contaminated soil in the case of Np and Pu, but decreased uptake of Am and Cm. Apparatus was designed to expose plants to Pu aerosols and maintain them in environmental chambers. Plant uptake of Cs137 was much greater from organic mud than predicted from data for simply contaminated soil. Effects will be studied simply contaminated soil. Effects will be studied of Pu on soil bacteria, actinomycetes, fungi, and soil respiratory activity. Methods were developed for determination of Pu in plant and microbial tissues and soils and for the distribution of Pu in microbial exocellular solution and within the cell. (Bopp-ORNL) W73-13344

RADIONUCLIDE DECLINE IN COLUMBIA

RIVER WATER.

Battelle-Pacific Northwest Labs., Richland,
Wash. Radiological Sciences Dept.

Report available from NTIS, Springfield, Va., as BNWL-1751, Vol. 2, Pt. 2; \$5.45 in paper copy, \$195 microfiche. In: Report BNWL-1751, Vol 2, Pt2, 881-84, April 1973. 3 tab, 4 fig.

Descriptors: *Sediments, *Sedimentation, *Radioisotopes, *Columbia River, Nuclear wastes, Path of pollutants, Cores, Sediment transport, Deposition (Sediments), Radioactivity techniques.

Shutdown of the original Hanford production reactors has greatly reduced radionuclide discharge to the Columbia River; however, resuspension of radionuclides in sediments will continue for several years. Decreases in several radionuclides were measured between August 1971 and September 1972 in water sampled at Mc-Nary Dam (Sc46, 90-fold; Zn65, 9-fold; Mn54, 6-fold); but only small decreases for long-lived radionuclides (Co60, Cs137, and Eu152). The transport of eight gamma emitters (totalled) past Bonneville Dam decreased 10-fold between the fall of 1971 and the fall of 1972. In agreement with a prediction from the Zn65/Co60 ratio in sediment cores obtained earlier, examination of recent cores showed deposition of 15 cm between April 1971 and February 1972 in McNary Reservoir. (Bopp-ORNL) W73-13345

DETERMINATION OF AG, HG, AND ARSENIC IN SEAWATER.
Battelle-Pacific Northwest Labs., Richland,

Wash. Radiological Sciences Dept.

Report available from NTIS, Springfield, Va., as BNWL-1751, Vol. 2, Pt. 2; \$5.45 in paper copy, \$1.45 microfiche. In: Report BNWL-1751, Vol 2, Pt.2, p 24-28, April 1973. 2 tab.

Descriptors: *Analytical techniques, *Water analysis, *Trace elements, Mercury, Silver, Arsenic, Neutron activation analysis, Spectrophotometry, Chemical precipitation, Chemical reactions, Oxidation-reduction potential, Oxidation, Reduction (Chemical), Sea water, Pollutant identification.

The precision of an ion exchange-neutron activa-The precision of an ion exchange-neutron activa-tion method for Ag was about 10% at a concentra-tion of 0.01 unit (micrograms/liter). The Hg in a 100-ml sample of seawater was reduced with Sn (CI)2 and measured in a 3-cm-diameter x 17-cm-long optical absorption cell. A several day treat-ment of the seawater with oxidizing agent con-verted non-ionic to ionic forms, increasing the yield on reduction with Sn (CI)2. The precision was about 10% at a concentration of 0.05 wit. The was about 10% at a concentration of 0.05 unit. The As in a 100 ml sample was coprecipitated with Fe (OH)3, dried, and analyzed by neutron activation. The precision was about 5% at a concentration of 1.8 units (the average found in ocean depth 1.0 units (the average found in ocean depth profiles). Ag in surface waters ranged from 0.0035 to 0.047 unit. Hg in a single surface sample from the Oregon coast was 0.011; at a depth of 50 meters, 0.049, (Bopp-ORNL) W73-13346

IRON-55 IN THE HUMAN POPULATIONS OF

THE WORLD.

Battelle-Pacific Northwest Labs., Richland,
Wash. Radiological Sciences Dept.

Report available from NTIS, Springfield, Va., as BNWL-1751, Vol. 2, Pt. 2; \$5.45 in paper copy, \$1.45 microfiche. In: Report BNWL-1751, Vol 2, Pt.2, p47-49, April 1973. 1 tab.

Descriptors: *Iron, *Sea water, *Marine animals, *Phytoplankton, Radioactivity techniques,

Crustaceans, Marine fish, Analytical techniques, Chemical precipitation, Fallout, Nuclear wastes, Food chains, Public health, Path of pollutants, Pacific Coast Region, Atlantic Ocean, Atlantic sal-mon, Pacific Ocean, Salmon, Pacific Northwest Identifiers: Iron radioisotopes.

The rate of decline of Fe55 in salmon paralleled that in the stratosphere. It is tentatively concluded that a 10-30 fold lower Fe55 specific activity in surface-feeding fish for midhatitudes as compared with northern latitudes (although the Fe55 content of the seawater is higher) results from a higher stable Fe content of the seawater. The analytical technique for concentrating Fe from large volumes of seawater consisted in coprecipitation with MnO2. In several marine animals from the Washington and Oregon coasts the Fe55 specific activity ranged from 0.4 to 1800 disintegrations/minute, mg Fe); in plankton, 600. (Bopp-ORNL) W73-13347

FATE AND EFFECTS OF RADIONUCLIDES IN

ALASKA.

Battelle-Pacific Northwest Labs., Richland,
Wash. Radiological Sciences Dept.

Report available from NTIS, Springfield, Va., as BNWL-1751, Vol. 2, Pt. 2; \$5.45 in paper copy, \$1.45 microfiche. In: Report BNWL-1751, Vol 2, Pt 2, p 10-11, April 1973.

Descriptors: *Arctic regions, *Alaska, *Radioisotopes, *Food chains, Absorption, Public health, Fallout, Lichens, Mosses, Radioecology, Mammals, Big game, Food webs, Terrestrial habitats, Radioactivity effects, Environmental ef-

ldentifiers: Sodium radioisotopes, Cesium radioisotopes.

Radionuclides transferred through the lichen-caribou-man food web that are found in soft tissue include Na22 and Cs137, which account for most of the dose to an Arctic resident; and also Fe55, Zn65, Ag110m and Po210. Those removed from further transport by deposition in bone are Mn54, Sr90, Pb210, and Ra226. The contribution of lichen and moss to the radionuclide content of food webs is somewhat lower in moose-forest ecosystems than in caribou-Arctic ecosystems. The shorter-lived radionuclides are more important for the moose-forest ecosystems. (Bopp-ORNL) W73-13348

ANNUAL SCIENTIFIC REPORT 1971
(RADIOACTIVE AND NON-RADIOACTIVE
CONTAMINATION OF THE ENVIRONMENT
AND THE METABOLISM OF SOME
RADIOELEMENTS; RADIOPHYSICAL CONTROL; RESEARCH ON BODY CONTAMINATION; WASTE DISPOSAL RESEARCH; N ONRADIOACTIVE ENVIRONMENTAL POLLUTION). TION). Centre d'Etude de l'Energie Nucleaire, Mol

ort available from NTIS, Springfield, Va., as EURFNR-1063; \$10.60 in paper copy, \$1.45 microfiche. In: Report EURFNR-1063, 1972. Section 3, p 55-58 and Section 4, p 1-7. 2 tab.

Descriptors: "Nuclear wastes, "Waste water treat-ment, "Radioecology, "Milk, Freshwater fish, Food chains, Path of pollutants, Soil-water-plant relationships, Ion exchange, Ion transport, Ab-sorption, Strontium radioisotopes, Tritium, Cobalt radioisotopes, Pastures, Sediments, Marine algae, Lead, Mercury, Toxicity, Public health, Potable

Identifiers: Ruthenium radioisotopes, Manganese

Group 5B-Sources of Pollution

After contamination of pastures by Ru106 as chloride, fixation on organic and fine-mineral soil fractions at 0-5 cm depth was greater than by sand at lower depth. Soil water collected in lysimeters did not change in Ru106 activity with depth. Up-take of Sr85 by plants increased with increasing organic matter in soils, and decreased with increasing clay. Milk from cows fed with hay from contaminated pastures was 10-20 times higher in tritium as compared with milk from cows given tritiated water. The uptake of tritium by marine algae was studied, as was the uptake of Mn54 and Co60 by freshwater fish, moss, and sediment. The uptake of various Ru salts by freshwater organisms was also studied. Pilot-plant-scale stuwere made of nuclear waste decontamination by ion exchange. Removal of Pb and Hg from wastes by FeS precipitate in ion-exchange columns was tested. The toxicity of Pb in drinking water is being studied. (Bopp-ORNL) W73-13349

WAVELENGTH FINGER DEGENERATION IN HELE-SHAW MODELS, Purdue Univ., Lafayette, Ind. School of Chen Engineering For primary bibliographic entry see Field 02F.

SIMULTANEOUS TRANSPORT OF SOLUTES AND WATER UNDER TRANSIENT UNSATU-RATED FLOW CONDITIONS, Volcani Inst. of Agricultural Research, Bet-Dagan (Israel). Dept. of Soil Physics.

For primary bibliographic entry see Field 02G. W73-13380

COPPER ACCUMULATION IN SOILS USED FOR HOP GROWING IN BAVARIA, (IN GER-MAN), Technische Hochschule, Munich (West Germany).

W. Rieder, and U. Schwertmann. Landwirtsch Forsch. Vol 25, No 2, p 170-177.

Landwirtsch Fotsch. Vol. 23, 130 a, p. 1972. English summary.
Identifiers: "Copper, Fungicides, "Germany (Bavaria), Growing, Iron, Manganese, Soils, "Wheat (Hop growing).

Due to the extensive use of Cu-containing fungicides, Cu is highly accumulated in these soils. Top-soil of 8 profiles with 7-16% clay contained more than 500 ppm total Cu after up to 43 yr of fungicide applications. The annual accumulation averaged 12.1 ppm Cu. Practically no Cu reached the water. Of the Cu accumulated, 90% was soluble in 0.05 M EDTA or 0.43 N HNO3 both commonly used for the extraction of 'plant available' Cu. Exchangeable Cu increased from «Yalange Cu. Exchangeable Cu incleased Homel (1 ppm to 7 ppm Cu. The relationship between pCu (exchangeable) and pH was linear between pH 4.5-6.5 with a slope pCu/pH of approximately 0.5 indicating a reaction between one Cu2+ and 2 H+. Liming the soil above pH 6.5 does not seem to reduce the exchangeable Cu significantly. Native total Cu was highly correlated with clay (r ± 0.975) and total Fe ($r \pm 0.985$). A Neubauer experiment with summer wheat indicated no detrimental effect of a high Cu content in the soil but compared to a normal soil the uptake of Fe and particularly of Mn by the plant was significantly reduced.— Copyright 1973, Biological Abstracts, Inc. W73-13395

CONTENTS OF TRACE ELEMENTS IN LU-CERNE (MEDICAGO VARIA MART) IN RELA-TION TO GROWTH, DEVELOPMENT AND WEATHER CONDITIONS IN 3 YEARS OF EX-

PERIMENT, (IN GERMAN), Technische Universitaet, Munich (West Germany). Institut fuer Gruenlandlehre.

Many). Institut fuer Grueniandienre.
G. Voigtlaender, V. Lang, and M. Kirchgessner.
Z. Acker-Pflanzenbau. Vol. 135, No. 3, p. 204-215. 1972. Illus. English summary.

Identifiers: Cobalt, Copper, Growth, Iron, *Lucerne clone, Manganese, Medicago-Varia, Milk, Molybdenum, Radiation, Temperature, *Trace elements, Weather, Zinc.

The initial growth of a lucerne clone was analyzed from the beginning of growth to full flowering for its content of Co, Mo, Cu, Mn, Zn and Fe. The results of the analyses and the corresponding data for temperature, rainfall and radiation were analyzed by factor analysis and multiple regression analysis. With increasing plant age the content of Mo, Cu, Zn, Mn, and Fe diminished. Higher total values for radiation and temperature were associated with higher contents of Mo and Cu but with lower contents of Mn. The requirements of Fe and Mo in a milk cow were met throughout the growth period. The Cu and Zn contents fell below the required concentration when the height reached 50 cm. The Mn contents remained below the normal requirements throughout. In the majority of cases a deficiency throughout. In the majority of cases a deficiency in the supply of Co is also to be expected.—Copyright 1973, Biological Abstracts, Inc. W73-13396

SURVEY OF ENVIRONMENTAL RADIOAC-TIVITY, JANUARY 1-DECEMBER 31, 1972, Ames Lab., Iowa.

M. D. Voss.

Available from NTIS, Springfield, Va., as Report No IS-3048; \$4.00 per paper copy, \$1.45 microfiche. Report No IS-3048, Feb 1973. 44 p.

Descriptors: *Environmental control, *Radioac-Descriptors: "Environmental control, "Radioscrivity, "Measurement, "Radioscotopes, "Assay, Effluent, Nuclear powerplants, Rivers, Air pollution, Water pollution, Soil contamination, Sediments, Vegetation, Fallout, Precipitation (Atmospheric), Ponds, Streams, "Iowa. Identifiers: Skunk River (Iowa), Squaw Creek

The environmental monitoring program of the Ames Laboratory of the USAEC including the Ames Laboratory Research Reactor (ALRR) is described. The environmental program consists of determinations of gross alpha and beta radioactivioeterminations or gross appin and oeta radioacuvi-yi n air, soil, vegetation, river water, ALRR out-fall, bottom sediment, precipitation, well water, and pond water samples. Off-site environmental air is routinely monitored at a station atop the Research Building, Iowa State University campus, Ames, Iowa. The alpha and beta radioactivity in Ames, lowa. Ine appa and oeta radioactivity in stream water was determined upstream and downstream from the confluence point of streams forming the drainage pattern from the ALRR. There is no measurable radioactivity in the stream water samples attributable to Ames Laboratory operations. (Houser-ORNL) W73-13402

MODEL OF THE ACCUMULATION OF FOSSIL CO2 IN THE ATMOSPHERE AND THE SEA, Washington Univ., Seattle. Dept. of Chemistry.

A. W. Fairhall. A. w. Falman.

Available from NTIS, Springfield, Va., as RLO-2225-T-20-8; \$4.00 in paper copy, \$1.45 in microfiche. Report RLO-2225-T-20-8, 1972. 16 p, 3

Descriptors: *Carbon radioisotopes, *Carbon dioxide, *Calcium carbonate, Hardness (Water), Calcite, Nutrient cycling, Boron, Calcium, Atmosphere, Air pollution effects, Water pollution effects, Mixing, Marine biology, Oceans, Chemical precipitation, Chemistry of precipitation, Ions, Absorption, Turnovers, Mathematical models, Public health, Fossil fuels, Nuclear powerplants, Tracers, Forecasting, Future planning (Projected), Ecology, Radioecology, Oceanography.

Absorption of CO2 from burning fossil fuel is predicted to cause the mixed layer of the oceans to become unsaturated with respect to calcium car-

bonate, by the year 2010 in one model and well bonate, by the year 2010 in one model and well into the next centruy by a second. To avoid harm to calcarious organisms, leveling off fuel consumption by the year 2000 should be considered. The first model is based on the controversial hypothesis of free absorption of carbon dioxide; the second model is based on limitation of absorption by ionic equilibria. The first model is supported both by the observation in the atmosphere of only about one-third the annual carbon dioxide emission from fuel, and by the decrease of C14 in tree rings. (Bopp-ORNL) W73-13403

USE OF HANFORD WASTE PONDS BY WATERFOWL AND OTHER BIRDS, Battelle-Pacific Northwest Labs., Richland, For primary bibliographic entry see Field 05C. W73-13404

AMCHITKA BIOENVIRONMENTAL PROGRAM. RESEARCH PROGRAM ON MARINE CRAM. RESEARCH PROGRAM ON MARINE ECOLOGY, AMCHITKA ISLAND, ALASKA, JULY 1, 1971-JUNE 30, 1972, Washington Univ., Seattle. For primary bibliographic entry see Field 05C. W73-13405

FINAL ENVIRONMENTAL STATEMENT RE-LATED TO OPERATION OF SURRY POWER STATION UNIT 1.
Directorate of Licensing (AEC), Washington,

For primary bibliographic entry see Field 05C. W73-13408

AQUATIC, BIOENVIRONMENTAL STUDIES IN THE COLUMBIA RIVER AT HANFORD 1945--1971. A BIBLIOGRAPHY WITH ABSTRACTS, Battelle-Pacific Northwest Labs., Richland, Wash

C. D. Becker. Available from NTIS Springfield, Va., as Report No. BNWL-1734; \$7.60 per copy, \$1.45 microfiche. Report BNWL-1734, Feb. 1973. 153 p, 416 ref.

Descriptors: *Nuclear powerplants, *Effluents, Water pollution, *Bibliographies, Abstracts, *Water pollution sources, *Columbia River, Washington, Biology, Metabolism, Aquatic environment, Aquatic life, Effects, Assay, Radioactivity, Hydrology, Public health, Food chains, Ecosystem. Identifiers: *Hanford site (Wash).

Publications prepared by Hanford staff scientists that deal with bioenvironmental studies in the central Columbia River during the period 1945 to 1971 are listed and abstracted. Four general topics are covered: (1) biology and ecology of river organ-isms, (2) thermal and chemical effects of reactor effluent discharges, (3) radioactivity releases fro reactor operations, and (4) hydrology of the Columbia River. Over 400 publications are in-cluded. The abstracts provide an insight into the scope and depth of diverse studies supported by the United States Atomic Energy Commission in order to evaluate any impact on the aquatic ecosystem throughout the 'plutonium production phase' of the Hanford operations. (Houser-ORNL)
W73-13409

FINAL ENVIRONMENTAL STATEMENT RE-LATED TO THE ST. LUCIE PLANT UNIT NO.

Directorate of Licensing (AEC), Washington, For primary bibliographic entry see Field 05C.

Sources of Pollution—Group 5B

FINAL ENVIRONMENTAL STATEMENT RE-LATED TO THE CONTINUATION OF CON-STRUCTION OF UNIT 2 AND THE OPERA-TION OF UNITS 1 AND 2 MILLSTONE NUCLEAR POWER STATION.

Directorate of Licensing (AEC), Washington, D.C. For primary bibliographic entry see Field 05C. W73-13411

FINAL ENVIRONMENTAL STATEMENT RE-LATED TO THE CONSTRUCTION OF SUSQUEHANNA STEAM ELECTRIC STATION UNITS 1 AND 2.

Directorate of Licensing (AEC), Washington, D.C.

ary bibliographic entry see Field 05C. W73-13412

FINAL ENVIRONMENTAL STATEMENT RE-LATED TO CONSTRUCTION OF NINE MILE POINT NUCLEAR STATION UNIT 2. Directorate of Licensing (AEC), Washington,

For primary bibliographic entry see Field 05C. W73-13413

RADIOACTIVE WASTE MANAGEMENT - A BIBLIOGRAPHY OF PUBLICLY AVAILABLE LITERATURE PERTAINING TO THE USAEC'S HANFORD, WASHINGTON PRODUCTION SITE.
Technical Information Center (AEC), Oak Ridge,

Available from USAEC, Tech Inf Center, Oak Ridge, Tenn., as Report TID-3340. Free. Report No. TID-3340, Aug 1973. 160 p, 1098 ref.

Descriptors: *Bibliographies, *Abstracts, *Radiation, *Radioactive wastes, *Radioactive waste disposal, Management, Washington, Meteorology, Ecology, Hydrology, Radioecology, Water pollution, Water pollution sources, *Columbia River, Groundwater, Surface waters, Monitoring, Assay, Public health, Administrative agencies. Identifiers: *Hanford site (Wash).

This bibliography contains abstracts of 1098 technical reports and journal articles which have appeared in Nuclear Science Abstracts from January 1951 through July 1973 pertaining to radioactive waste management at the Hanford site. The abstracts are grouped into ten categories. Within the categories, they are arranged by NSA volume and abstract number and cover subjects as follows: (1) Environmental monitoring, ecology and radiological surveys, (2) Columbia River studies, (3) Ground disposal and soil studies, (4) Geology, hydrology, and meteorology, (5) Stack disposal, (6) Waste storage tanks and corrosion robbens; (7) Waste fivestice and califification (8) problems, (7) Waste fixation and solidification, (8) Waste processing and properties, (9) Waste management, (10) Miscellaneous. Recent classifimanagement, (10) Miscelaneous, Recent classifi-cation reviews by the AEC have resulted in the declassification of additional documents not yet processed for inclusion in Nuclear Science Abstracts or yet made publicly available. A supplement to this bibliography will be issued in the near future when necessary processing has been completed. (Houser-ORNL) W73-13414

EIGHTEENTH ANNUAL CONFERENCE ON BIOASSAY, ENVIRONMENTAL AND ANALYTICAL CHEMISTRY, OCT. 10-11, 1972,

PROGRAM AND ABSTRACTS.
Argonne National Lab., Ill.
For primary bibliographic entry see Field 05A. W73-13415

Commissariat a l'Energie Atomique, Fontenay-aux-Roses (France). Centre d'Etudes Nucleaires.

Available from NTIS, Springfield, Va., as EUR-5000f; \$4.00 in paper copy, \$1.45 in microfiche. Report EUR-5000f, May 1973. 23 p, 4 fig, 6 tab, 24

Descriptors: *Fallout, *Food chains, *Agriculture, *Path of pollutants, Irrigation effects, Vegetable crops, Crop response, Alfalfa, Wheat, Corn (Field), Cereal crops, Oats, Public health, Reviews, Soil contamination effects, Soil moisture, Soil properties, Potassium, Europe, Ca-tion exchange, Absorption, Radioecology, Soil-water-plant relationships, Seasonal. Identifiers: *Cesium radioiosotopes.

This review compares in-situ tests with pot stu-dies. The correlation of Cs with K in vegetation found in pot studies was masked by the effect from variations in the K content of the soil encountered in the field. With both sandy and loamy soils transfer coefficients from soil to plants were 2-3 times less in in-situ than in pot studies when the concentration of available Cs in the soil was more than 1%, but the two types of studies were in better agreement at lower Cs concentration. Irrigation increased Cs uptake in in-situ studies since fixation of Cs by soil was decreased and root con-tact with suspended particles containing sorbed Cs was increased. The correspondence was found that a fallout value of 1 millicurie Cs137/sq km gave 4 picoCuries/kg in arable soil and 12 picoCuries/kg in prairie soil. Cs uptake by leafy vegetables was affected more by soil moisture and seasonal factors than uptake by wheat. (Bopp-OBMI) ORNI) W73-13416

SOIL CONTAMINATION. 2. PENETRATION OF RADIOACTIVE IONS PRESENT IN SOLU-TIONS DUMPED ON THE SURFACE (CON-TAMINATION DES SOLS. COMPORTEMENT DES IONS RADIOACTIFS DANS LES SOLS NON STURES), Commissariat a l'Energie Atomique, Cadarache

(France). Centre d'Etudes Nucleaires.

D. Rancon.
Available from NTIS, Springfield, Va., as CEA-R-3635 (2); \$4.00 in paper copy, \$1.45 in microfiche. Report CEA-R-3635 (2), Feb 1973. 50 p, 21 fig, 5

Descriptors: "Nuclear wastes, "Soil contamina-tion, "Strontium radioisotopes, "Iodine radioisotopes, Waste disposal, Public health, Groundwater, Water quality control, Monitoring, Soil moisture, Soil analysis, Absorption, "Path of pollutants, Tracers, Radioactivity techniques, Leaching, Methodology.

After surface disposal of solutions containing radionuclides, radioactivity penetration into the soil was measured using instruments placed in pipes (see W72-00942 for prior work). Most 1131 was retained near the surface, and washing by nonradioactive solutions removed only a small part. However, retention was reduced by the presence of NaI in solution (0.01 N) such that II31 could be used as a tracer of the front of water diffusion. Generally Sr85 sorption was much stronger than that of I131; however the presence of stable Sr and Ca in solution reduced Sr85 retention, and soil could be decontaminated of sorbed Sr85 by washing with solutions containing sufficient Ca. The effect of soil moisture on the radioactivity measurements was determined. (Bopp-ORNL) W73-13417

PLANT ACCUMULATIONS OF RADIOACTIVE STRONTIUM WITH SPECIAL REFERENCE TO THE STRONTIUM-CALCIUM RELATIONSHIP

AS INFLUENCED BY NITROGEN,
Danish Atomic Energy Commission, Risoe.
Research Establishment. A. J. Andersen.

Available from NTIS, Springfield, Va., as RISO-278; \$5.45 in paper copy, \$1.45 in microfiche. Re port RISO-278, Jan 1973. 56 p, 4 fig, 6 tab, 100 ref.

Descriptors: *Soil-water-plant relationships, *Strontium radioisotopes, *Food chains, *Soil contamination effects, Radioecology, Path of pol-lutants, Fallout, Fertilization, Nitrates, Calcium, Soil properties, Legumes, Forage grasses, Phosphates, Agronomy, Absorption, Europe, Agriculture, Lime, Oats. Identifiers: *Denmark.

A 10-year study of factors affecting Sr90 uptake by plants is summarized. Uptake varies between species but is generally higher for legumes than grasses. Uptake from heavy clay loam may be only 0.1 that from light sandy soil of low pH. Deep plowing may reduce uptake by shallow-rooted plants from 2- to 5-fold with loamy soil. Most Denmark soils have high Ca so that lime application proves ineffective, bowever phosphate surjection proves ineffective; bowever phosphate surjection proves ineffective; bowever phosphate surjection proves. tion proves ineffective; however phosphate application reduces uptake, possibly in part by forming Sr phosphates. There is little effect from K and Mg in fertilizer, but nitrate is a nutritional factor that in fertuzer, our intrate is a nutritional factor that affects the ability of plants to discriminate between Sr and Ca. Nitrate decreased the Sr/Ca ratio in oat plants grown both in water culture and in soil in pots. (Bopp-ORNL) W73-13418

SIMPLE MODEL OF STRONTIUM AND MANGANESE DYNAMICS IN A TROPICAL MANGANEST, RAIN FOREST, National Lab., Ill.

Argonne National Lab., Ill.
C. F. Jordan, J. R. Kline, and D. S. Sasscer.
Health Physics, Vol 24, p 477-489, May 1973. 7 fig, 5 tab. 20 ref.

Descriptors: *Fallout, *Strontium radioisotopes, Descriptors: "Faliout, "Strontium radioisotopes, "Rain forests, "Radioecology, Nuclear explosions, Excavation, "Path of pollutants, Runoff, Cycles, Public health, "Mathematical models, Computer models, Digital computers, Computer programs, Forecasting, Soil-water-plant relationships, Decomposing organic matter, "Puerto Rico, Absorption." Absorption.
Identifiers: Manganese radioisotopes.

The fate of fallout radionuclides (including the case of an acute injection from the use of thermonuclear devices for excavations) was predicted by modelling measurements of Sr and Mn fluxes in ecosystem compartments. Measurements of fal-lout radionuclides in the forest validated the model. The turnover time of Sr90 was affected, in order of decreasing sensitivity, by the flow from litter to soil, the flow from canopy to litter, and rate of runoff. The shorter half-life for radioactive ecay made Mn54 (312 days) more sensitive th Sr90 (28.8 years) to the quantity in the canopy, but the turnover time of Mn 54 was relatively insensitive to other parameters of the model. Radioactive decay is about three times as important as runoff in the elimination of Sr90 and accounts for 99% of the elimination of Mn54. The Sr90 activity in wood peaks about 12 years following a peak in fallout deposition. (Bopp-ORNL) W73-13419

DISTRIBUTION OF CS137 IN SOILS AND VEGETATION ON THE ISLAND OF PUERTO

VEGETATION
RICO,
Argonne National Lab., Ill.
J. R. Kline, J. A. Colon, and S. S. Brar.
Health Physics, Vol 24, p 469-475, May 1973. 4 fig,

Descriptors: "Fallout, "Radioisotopes, "Rainfall, "Puerto Rico, Plants, Absorption plant physiology, Mountain forests, Ferns, Mosses, Lichens, Cycling nutrients, Public health, "Path of pollutants, Radiocology, Absorption.

Identifiers: "Cesium radioisotopes.

Group 5B-Sources of Pollution

Only Ce144, Cs137, Mn54, and Zr95-Nb95 were detected by gamma spectroscopy in most samples in significant amounts, and only Cs137 is discussed in this report because of the similarity of distribution of the other nuclides (see also W73-04303). Levels in epiphytic plants (bromeliads, ferns, mosses, lichens, and liverworts) that derive ferns, mosses, inchens, and inverworts) that cerive their mineral nutrient requirements by interception of aerosols averaged 4.8 times those in most rooted plants. However, the hypothesis that aerosol scavenging by plants gave a major con-tribution to fallout interception was rejected ex-cept at localized mountain summit sites that are lit-tle used for agricultural production. The decrease in Cs137 enjus from the eastern to the western set in Cs137 going from the eastern to the western part of the island is accounted for by rainfall scaveng-ing of atmospheric aerosols. (Bopp-ORNL) W73-13423

FIXING CATION INTERACTION WITH BLISTER-LIKE OSMOTIC SWELLING ON VERMICULITE CLEAVAGES, Wisconsin Univ., Madison. Dept. of Soil Science. For primary bibliographic entry see Field 02G. W73.1425

DIETARY INTAKE OF COBALT BY THE ADULT POPULATION OF TARAPUR, arapur Atomic Power Station (India). I. S. Bhat.

Health Physics, Vol 24, p 553-554, May 1973. 3 tab, 9 ref

Descriptors: *Cobalt radioisotopes, *Nuclear wastes, *Food chains, Public helath, Asia, Soils, Vegetable crops, Foods, Diets, Trace elements, Path of pollutants, Water pollution sources. Identifiers: *India (Tarapur).

Dietary intake of Co was determined as one of the elements whose radioisotopes may be released in refluents from nuclear powerplants. Intake by the Tarapur population is 65% from cereals, 22% from seafood, and the remainder from vegetables, meat, and milk. The average daily intake of 254 micrograms/day is comparable with that in the United States; however, in the United States 35% is from meat and milk, 35% from cereals, 12% from sea food, and the remainder from vegetables The low Co content of the volcanic soils of Japan results in a 10-fold lower content in vegetal compared with Tarapur and the United States, where the content of vegetables is comparable. (Bopp-ORNL) W73-13426

ON THE WIND-DRIVEN CIRCULATION OF A

STRATTFIED OCEAN, University of East Anglia, Norwich (England). School of Mathematics and Physics. J. A. Johnson.

Journal of Marine Research, Vol 29, No 3, p 197-213, 1971. 5 fig, 10 ref.

Descriptors: *Ocean circulation, *Theoretical analysis, *Thermal stratification, *Mathematical models, *Winds, Oceanography, Hydrography, Temperature, Velocity, Model studies, Solar radiation, Wind velocity.

Various similarity solutions have been used to represent the depth variation in temperature and velocity fields of the theory of circulation in the thermal layer of the ocean. The main limitation to these solutions concerns the choice of boundary conditions at the surface when there is an applied wind stress and heat input. The ocean has been di wind stress and neat lipit. I ne ocean has been divided into an Ekman layer, a thermal layer and an almost isothermal abyssal layer. Theoretical consideration is given to the conditions under which the driving of circulation by wind-stress is important, and the Ekman-layer suction is matched to the vertical velocity in the thermal layer. The results for an applied zonal wind stress are given. Comparison of the calculated temperature field with observed temperature distributions is satisfactory. Upwelling may still be necessary in satisfactory. Opening may still be incessary in coastal boundary layers even when there is no component of wind stress parallel to the coast and hence no Ekman-layer flux away from the coast. Horizontal advection was found to be more impor-tant than horizontal diffusion of heat in determining the surface temperature distribution. (Jerome -Vanderbilt) W73-13429

CONVECTIVE INSTABILITY IN LIQUID POOLS HEATED FROM BELOW, Washington Univ., Seattle. Dept. of Chemical Eneering.

For primary W73-13442 ary bibliographic entry see Field 08B.

THERMALLY-DRIVEN LINEAR VORTEX, Florida State Univ., Tallahassee. Dept. of Mathematics.

For primar W73-13443 ary bibliographic entry see Field 08B.

DYNAMIC COOLING.

Technology Review, Vol 73, No 7, p. 54-55, May

Descriptors: *Ohio River, *Thermal pollution, Descriptors: Onto River, Therma politition, Forecasting, "Computer programs, Water quality, Water quality control, Model studies, Mathematical models, Cooling, Rivers, Data processing, Computer programs, Computer models, Electric power production, Thermal power plants, Hydrothermal studies, Heat transfer, Heat Identifiers: COLHEAT-studies.

The COLHEAT computer program, developed by the Pacific Northwest Laboratories of Battelle Memorial Institute, is a method of determining the Memorial Institute, is a method of determining the cooling capacity of a river, based upon a multiplicity of parameters. In application to the streams of the Ohio River Basin, this program predicted that thermal loads will exceed cooling capacity by some time between 1984 and 1990. The standard upon which this program was based was that quantity of heat which could be assimilated by any stream and then dissipated to the atmosphere within a stream envelope of 5 F above background. Since the cooling capacity of the streams varies significantly depending on the season, the COLHEAT program shows that power demand will exceed cooling capacity during the summer in the Allegheny River watershed by 1980. Similar conditions exist in other areas. In such cases present cooling capacity must be supplecases present cooling capacity must be supplemented with cooling towers and ponds. (Jerome-Vanderbilt) W73-13449

MEASURING THERMAL PLUMES IN THREE DIMENSIONS

Westinghouse Electric Corp., Pittsburgh, Pa. L. L. Simmons, and J. A. Nutant. Power Engineering, Vol 75, No 10, p. 44-45, Oc-

Descriptors: *Thermal pollution, *Temperature, *Jets, Distribution patterns, Sampling, Monitoring, Thermometers, Heated water, Thermometers, Water quality, Mixing, Density. Identifiers: *Thermal plumes.

Determining the three-dimensional distribution of waste heat in a thermal plume can be done by either a portable or a fixed system. With either, temperatures must be recorded as functions of surface dimensions, depth and time. The fixed system must be positioned carefully in the study area to assure that it actually does measure the desired water parameters. Data are recorded for retrieval or telemetered into a central receiver. Portable systems can use either remote or in-situ sensing. Remote sensing relies on infrared radiation detection through overflights or from landbased scanning units. In-situ sensing may be done with temperature-dependent resistance elements called thermistors. These thermistors can be placed at pre-determined levels on an electromechanical cable which is lowered from a boat at desired locations. (Oleszkiewicz-Vanderbilt) W73-13460. W73-13450

SPECTRA OF THE TEMPERATURE AND HU-MIDITY FLUCTUATIONS IN THE MARINE BOUNDARY LAVER, Commonwealth Scientific and Industrial Research Organization, Sydney (Australia). For primary bibliographic entry see Field 07B. W73-13455

SIMPLIFIED METHOD FOR DETERMINING TOWER DRIFT RATE,

K. Juris. ustrial Water Engineering, p. 30-31, April/May 1972. 2 fig.

Descriptors: "Cooling towers, "Mathematical models, "Evaporation, "Dissolved solids, Water cooling, Design, Condensation, Water loss, Model studies, Computer models, Flow rates. Identifiers: "Spray ponds, Drift rates, Cooling seathers."

A simplified method is presented which only requires the measurement of the dissolved solids requires the measurement of the dissolved solids concentration of make-up water and recirculated hot water to determine drift rates from mechanical and natural draft cooling towers and spray ponds. The circulating, evaporation, drift, make-up and blowdown water flows constitute the flow of water through a closed cycle cooling system. When blowdown flow is shut off, the concentration of dissolved solids in the recirculating water increases until a constant value is reached when tion of dissolved solids in the recirculating water increases until a constant value is reached when the rate of dissolved solids escaping in the drift of the tower equals the rate of dissolved solids entering in the form of make-up flow. The rate of concentration of dissolved solids in the circulating and make the solution of dissolved solids in the circulating and make-up water is indirectly related to the drift rate. A high ratio indicates a low drift rate and a rate. A high ratio indicates a low drift rate and a low ratio indicates a high drift rate. An example of this relationship is presented. Since a high ratio may present some problems it is advised to perform the experiments when the dissolved solid content of the make-up water is low and in the winter when the evaporation rate would be less. A computer program of the situation could be developed using the usual cooling tower design parameters and the climatological parameters of dew point, dry bulb and source water temperatures as input data. (Jerome-Vanderbilt) W73-13457

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EFFECT OF NONCONDENSABLES IN SEA WATER EVAPORATORS, Burns and Roe Construction Corp., Chula Vista, Calif.

For primary bibliographic entry see Field 03E. W73-13463

NOMOGRAMS SIMPLIFY DESIGN OF STEAM

CONDENSERS,
For primary bibliographic entry see Field 08C.
W73-13464

WITH EXCHANGERS PROBLEMS ETHYLENE PLANTS, Schmidtsche Heissdampf G.m.b.H., Kassel (West

Germany). For primary bibliographic entry see Field 08G. W73-13465

WARM WATER ADVECTION IN THE SOUTHERN BEAUFORT SEA AUGUST-SE-PTEMBER 1971, Coast Guard Washington, D.C. Oceanographic Unit.
For primary bibliographic entry see Field 02E. W73-13466

IRRIGATION MANAGEMENT FOR CONTROL OF QUALITY OF IRRIGATION RETURN FLOW, FLOW, Utah State Univ., Logan. Dept. of Agricultural and Irrigation Engineering. and Irrigation Engineering. ary bibliographic entry see Field 05G.

WATER POLLUTION AND ASSOCIATED EF-FECTS FROM STREET SALTING, Edison Water Quality Research Lab., N. J. R. Field, E. J. Struzeski, Jr., H. E. Masters, and A. N. Tafuri. N. Tafuri. Copy available from GPO Sup Doc as EP1.23/2:73-257, \$0.85; microfiche from NTIS as PB-222 795, \$1.45. Environmental Protection Agency, Technology Series Report, EPA-R2-73-237, May 1973. 48 p, 28 fig, 11 tab, 109 ref.

Descriptors: Environmental effects, *Highway icing, Groundwater, Corrosion, Water pollution effects, Runoff, *Snow removal, Water supply, *Deicers, *Melting, Heating.

Identifiers: *Hydrophobic substances, *Salt storage, Stormwater runoff.

A state-of-the-art review is presented of highway deicing practices and associated environmental effects. The bare pavement policy has resulted in a great increase in the use of deicing salts. They are more efficient and economical than abrasives. more efficient and economical than abrasives. However, there is excessive application leading to environmental problems. Besides chemical melting, various methods for deicing exist. Some of these are stationary and mobile thermal melting units, alternate deicing compounds, snow adhesion reducing pavements, electromagnetic energy for ice shattering, and drainage systems designed to capture snowmelt for treatment or control. Salt storage facilities often become a major contributing source of local groundwater and surface water salt contamination. Coverage of salt piles is salt contamination. Coverage of salt piles is becoming more prevalent. Types of enclosed structures are illustrated, and cost considerations structures are illustrated, and cost considerations given. High chloride concentration levels have been found in roadway runoff. The special additives in deicing salts may create more severe pollutional problems than the chloride salts. Serious groundwater contamination has occurred in many locations, for example, Maine, Massachusetts, New Hampshire, and Michigan. Widespread damage of roadside soils and vegetation has been observed in areas of liberal salt usage. (EPA) W73-13471

ON PROPERTIES OF SEAWATER DEFINED BY TEMPERATURE, SALINITY AND PRESSURE, Yale Univ., New Haven, Conn. Dept. of Geology and Geophysics and Geophysics.
For primary bibliographic entry see Field 02K.
W73-13477

THE USE OF WATER QUALITY SIMULATION MODELS IN THE ANALYSIS OF THE THER-MODELS IN THE ANALYSIS OF THE THEM-MAL EFFECTS PROBLEM, RAND Corp., Santa Monica, Calif. E. C. Gritton, J. Kvitky, and J. J. Leendertse. Paper presented at American Nuclear Society Eighteenth Annual Meeting, June 18-22, 1972. Las Vegas, Nevada. 5 p., 7 ref.

Descriptors: *Model studies, *Estuaries, *Thermal pollution, *Temperature, Water quality,

Water quality control, Mathematical models, Simulation analysis, Coasts, Finite element analy-sis, Density, Salinity, Heat balance, Hydrologic equation, Mixing, Surface waters, Data collec-tions, Date processing.

A water-quality simulation model for well mixed estuaries and coastal seas has been developed. It is based on the numerical solution, by finite difference techniques of the two-dimensional vertically integrated equations of motion and continuity for fluid. Recently, a heat transport model has been incorporated into this simulation model to make it useful in analyzing thermal effect problems. Heat is regarded as a dissolved constituent, and the practical heat equation is identical to the mass transport equation. The arrangement of the equation enables one to fully account for temperature-dependent processes such as reaeratemperature-dependent processes such as reaera-tion, coliform die-away, dissolved oxygen, biochemical oxygen demand, reaction coefficient, biochemical oxygen demand, reaction coefficient, and dissolved oxygen saturation concentration by making reaction rates temperature dependent. The external sources or sinks of thermal energy into the waters of a bay or estuary are mainly through surface heat exchange processes and large thermal discharges from power plants. These sources can be accounted for in the model. The model is now being used in studies of Jamaica Bay, Long Island, New York, and Tampa Bay, Florida. (Jerome -Vanderbilt) W73-13479

MAPS SHOWING AREAS IN THE SAN FRAN-CISCO BAY REGION WHERE NITRATE, BORON, AND DISSOLVED SOLIDS IN GEOUND WATER MAY INFLUENCE LOCAL OR REGIONAL DEVELOPMENT, Geological Survey, Washington, D.C. For primary bibliographic entry see Field 07C. W73-13520

EFFECTS OF HIGHWAY DE-ICING SALTS ON GROUNDWATER AND WATER SUPPLIES IN MASSACHUSETTS, Geological Survey, Boston, Mass. S. J. Pollock, and L. G. Toler.

Highway Research Record, No 425, p 17-22, 1973.

Descriptors: *Deicers, *Water pollution sources, *Massachusetts, *Salinity, Path of pollutants, Chlorides, Groundwater, Observation wells, Monitoring, Snow removal. Identifiers: *Road salting.

The concentration of chloride in some public water supplies has increased significantly during the last few years. This increase corresponds to the increased use of salts for de-icing highways. In some localities, the concentration of chloride has increased beyond the 250 mg per liter recommended by the U.S. Public Health Service as an unper limit for drinking water supplies. In 1965 a mended by the U.S. Public Health Service as an upper limit for drinking water supplies. In 1965, a upper limit for drinking water supplies. In 1965, a program was begun to monitor the concentration of chloride in groundwater along state highways in Massachusetts. Initially, 10 sites were selected to represent various types of geologic materials along old and new highways. At most sites, two wells were installed, one at 15 ft and one at 30 ft from the highway. At one site, 12 wells were installed at several depths and distances for the highway. All wells were on the downgrade side of the highway with respect to the water table. Samples were collected from each well periodically and analyzed for chloride. The concentration of chloride in normal, uncontaminated groundwater in eastern Masachusetts is about 5 to 15 mg per liter. Chloride mal, uncontaminated groundwater in eastern Mas-sachusetts is about 5 to 15 mg per liter. Chloride concentration in the aquifers at the test sites near highways and analyses of water from wells near heavily salted highways and salt storage sites in-dicate that a significant part of the salt applied to roadways is entering the groundwater system (K-napp-USGS) W73-13525

EFFECTS OF PHOSPHORUS APPLICATION

RATE, SOIL PROPERTIES, AND LEACHING
MODE ON P-32 MOVEMENT IN SOIL
COLUMNS,
Ohio State Univ., Columbus.
T. J. Logan, and E. O. McLean.
Soil Science Society of America Proceedings, Vol
37, No 3, p 371-374, May-June 1973. 2 fig, 2 tab, 13

Descriptors: *Leaching, *Phosphates, *Water pol-lution sources, *Fertilizers, Path of pollutants, Adsorption, Solubility, Nutrients, Nutrient removal. Identifiers: *Phosphorus fixation

Movement of monocalcium phosphate labeled with P-32 was investigated in column experiments with application rate, fixation capacity, and mode and intensity of leaching as variables. Three soils of contrasting texture and fixation capacity were studied. Leaching of P increased with application rate and intensity of leaching. Constant head leaching resulted in greater movement of P-32 out of the surface layer and greater accumulation in the leachate than intermittent leaching. In general, P 32 recovered in the leachate was nonionic except in instances where maximum leaching occurred. Significant amounts of P-32 were recovered in the Significant amounts of P-32 were recovered in the leachate only with sandy loam soil and at the highest application rate. (Knapp-USGS) W73-13535

HYDRAULIC SAND-MODEL STUDY OF THE CYCLIC FLOW OF SALT WATER IN A COASTAL AQUIFER, Geological Survey, Phoenix, Ariz. For primary bibliographic entry see Field 02L. W73-13558

BEHAVIOR OF DETERGENTS (ABS), BACTERIA, AND DISSOLVED SOLIDS IN WATER-SATURATED SOILS, Geological Survey, Denver, Colo. H. G. Page, C. H. Wayman, and J. B. Robertson. Geological Survey Professional Paper 450-E, p E179-E181, 1962. 2 fig, 1 tab, 7 ref.

Descriptors: Filtration, *Detergents, E. Coli, *Surfactants, Bacteria, Clogging, *Soil filters, Tracers, *Sewage effluents, *Alkylbenzene sulfonates, Treatment, Permeability, Porosity, Water pollution control. pollution control. Identifiers: Methylene-blue, Agar, Colloidal alu-

The comparative effectiveness of a coarse-grained, a fine-grained, and a colloid-coated soil in removing ABS, dissolved solids, and bacteria from sewage effluent was determined under satu-rated-flow conditions. Coarse sand and sandy loam removed about 90 percent of the bacteria from sewage within a few feet of travel, but addi-tional travel did not remove all the remaining bac-teria. Dissolved solids and detergent (ABS) con-tent virtually were unaffected by filtration of satu-rated flow. Because bacterial clogging occurred quickly in fine-grained soils, coarser sand was preferred as a pollution filter for the removal of bacteria. (Campbell-NWWA) W73-13560

GROUND-WATER CONTAMINATION AND LEGAL CONTROLS IN MICHIGAN, M. Deutsch. Geological Survey Water Supply Paper 1691, 79 p.

Descriptors: *Michigan, *Groundwater resources, Legal aspects, *Pollution abatement, Freshwater, Water wells, Well regulations, Saline water en-croachment, Industrial wastes. Identifiers: *Groundwater contamination, Hydrologic studies, Regional surveys.

Group 5B-Sources of Pollution

The great importance of the fresh ground-water resources of Michigan is evident because 90 per-cent of the rural and about 70 percent of the total population of the State exclusive of the Detroit metropolitan area are supplied from underground sources. Manmade and natural contaminants, inmetropolitan area are supplied from underground ources. Mammade and natural contaminants, including many types of chemical and organic matter, have entered many of the numerous aquifers of the State. Industrial and domestic wastes, septic tanks, leaking sewers, flood waters or other poor quality surface waters, mine waters, solids atored or spread at the surface, and even airborne wastes all have been sources of ground water contamination in Michigan. In addition, naturally occurring saline waters have been induced into other aquifers by overpumping or unrestricted flow from artesian wells, possibly by dewatering operations, and by the deepening of surface stream channels. Vertical migration of saline waters through open holes from formations underlying various important aquifers also has spoiled some of the fresh ground waters in the State. In spite of the contamination that has occurred, however, the total amount of ground water that has been spoiled is only a small part of the total resource. Overall legal authority to control most types of ground-water contamination in the State resource. Overain legia automyty to control most types of ground-water contamination in the State has been assigned by the Michigan Legislature to the Water Resources Commission, although the Department of Conservation and the Health De-partment also exercise important water-pollution control functions. (Campbell-NWWA)

EFFECT OF THE RATE OF APPLICATION EFFECT OF THE RATE OF APPLICATION AND THE VOLUME OF APPLIED WATER ON THE RATE OF MOBILITY OF CERTAIN INSECTICIDES IN CLAY SOIL, Ain Shams Univ., Cairo (Egypt). Faculty of

Agriculture.
M. S. El-Rafie, and Z. H. Zidan.
Bull Entomol Soc Egypt Econ Ser. 5. p 85-94.

1971

Identifiers: *Clay soils, Heptachlor, *Insecticides, Mobility, Residues, Sand, Soils, Temik, Water pollution sources, *Path of pollutants.

The effect of 3 successive doses and 3 volumes of The effect of 3 successive doses and 3 volumes of applied water on the rate of mobility of hep-tachlor, Di-Syston and Temik was studied in 2 types of soil (i.e., sand and clay soil), under laboratory conditions, in individual glass tubes. Residues were chemically analyzed in 5 separated layers of each experimental tube and in the leach. The effects on the rates of binding within the top layer, the rates of distribution within the 2nd to the 5th layers and the rates of leach were taken as a criterion.—Copyright 1973, Biological Abstracts, W73-13579

DESTRUCTION OF ORGANIC SUBSTANCE IN OOZE DEPOSITS, (IN RUSSIAN), Akademiya Nauk SSSR, Moscow. Institut Biologii Vnutrennykh Vod.

V. I. Romanenko, and S. I. Kuznetsov. Mikrobiologiya. Vol 41, No 2, p 356-361. 1972. Illus. English summary.

Identifiers: *Ooze deposits, *Organic destruction, Reservoirs, Substances, *Sediment deposition, Aerobic conditions.

The analysis of the circulation of organic substance in water reservoirs requires the determina-tion of the degree of destruction of organic substances sedimented from water into ooze deposits.
The method of determination of aerobic and The method of determination of aerobic and anaerobic decomposition of organic substances are described and the results of deferminations of bottom deposits in the Rybinsk reservoir are presented. During the vegetative period of 1968, 111 mg C m2/day of organic substance was decomposed by aerobic processes and in 1969, 205 mg C m2/day. Individual determinations showed that 40% of the total mineralized organic substance/day was decomposed under anaerobic conditions.--Copyright 1973, Biological Abstracts, Inc. W73-13584

RADIOACTIVE FALLOUT IN RAIN AT MEL-BOURNE, 1958 THROUGH 1970, Commonwealth Scientific and Industrial Research

Organization, Appendale (Australia). Div. of Atmospheric Physics.

B. B. Hicks.

Tellus. Vol 24, No 3, p 277-281. 1972. Illus. Identifiers: *Australia (Melbourne), *Radioactive fallout, *Rain, Measurements.

Gross beta-activity measurements were analyzed from the point of view of the annual cycle in the lower troposphere. The annual cycles found in rainfall concentration of radioactive fallout and in the total fallout deposition peak at different times; the former in Dec. and the latter in Aug. The difference was explained in terms of the variation in rainfall. A phase difference was apparent between cycles and in situ stratospheric data, suggesting that ground level air lags behind the stratophere by about 1 or 2 mo.—Copyright 1973, Biological Abstracts

LOADING THE RHINE WITH ORGANIC POL-

LUTANTS, (IN GERMAN), Kernforschungszentrum, Karlsruhe (West Ger-many). Institut fuer Radiochemie. W. Koelle, H. Ruf, and L. Stieglitz.

Naturwissenschaften, Vol 59, No 7, p 299-305.

1972. Illus. English summary.
Identifiers: Carbon, Chlorine, DDE, Fish, *Germany (Rhine River), Mercury, Organic loading, nts. Pesticides

The organic pollution of the Rhine is discussed using overall analyses like total organic C, organic Cl and radiocarbon dating. Fish of Lake Constance and the Rhine were analyzed for unpolar petrochemicals and Hg. They showed an increasperforment of hydrocarbons, chlorinated benzenes, chlorinated biphenyls and DDE along the flow of the Rhine. The maximum content of organic Cl in the fat was 340 ppm and of Hg in muscle tissue, 1.32 ppm.—Copyright 1973, Biological Abstracts. Inc. cal Abstracts, Inc. W73-13587

THE OCCURRENCE AND DISTRIBUTION OF MERCURY IN THE SEDIMENTS OF PETIT LAC (WESTERN LAKE GENEVA),

Geneva Univ. (Switerzerland). Dept. of Geology. J-P., Vernet, and R. L. Thomas. Eclogae Geol Helv. Vol 65, No 2, p 307-316. 1972.

Identifiers: Contamination, Distribution patterns, Industrial wastes, Lakes, *Mercury, Petit Lac, *Sediments, Switerzerland (Lake Geneva), *Lake

Hg analyses of surface sediments from the Petit estern Lake Geneva) gave values rangi from 24-1274 ppb with a mean of 622 ppb representing an increase in concentration at least 3 es above natural levels. The contaminant Hg to Lake Geneva is derived from industrial sources in the upper Rhone River draining into the eastern part of the lake (Grand Lac) with subsequent transportation in association with fine sediments particles to the Petit Lac. In the Petit Lac the Hg enriched sediment is dispersed by current activity with sedimentation occurring predominantly in 3 deeper water sub-basins. From correlation analysis the Hg is adsorbed by amorphous, hydrated iron oxides with complexed phosphorus which occurs as a coating on individual clay mineral particles.—Copyright 1973, Biological Abstracts, Inc. W73-13588 LEVELS OF MERCURY IN THE SEDIMENTS OF SOME SWISS LAKES, INCLUDING LAKE GENEVA AND THE RHONE RIVER, Geneva Univ. (Switzerland). Dept. of Geology.

J-P. Vernet, and R. L. Thomas. Eclogae Geol Helv. Vol 65, No 2, p 293-306, 1972.

Identifiers: *Lake Geneva, Lakes, *Mercury, *R-hone river, Sediments, *Switzerland.

Sediment samples taken from Lakes Bienne, Brienz, Joux, Tuma, Saoseo, Bodan and Geneva were analyzed for total Hg. Other than Lake Brienz all of the lakes show some evidence of Hg contamination from atmospheric or industrial/mucipal sources with levels of Hg above the accepted background level of 200 ppb. The most southeasterly lakes, Tuma and Saoseo, show the effect of the precipitation of atmospheric Hg derived from the industrial complexes of Northern Italy. Higher levels are observed in Lake Saoseo derived from the industrial complexes of Northern Italy. Higher levels are observed in Lake Saoseo than in Lake Tuma due to its geographic location relative to prevailing westerly and southwesterly winds. Sediment Hg concentration profiles in the Rhone River identify 3 canal systems, X, Y and Z and the La Drance tributary as the sources of industrial Hg contamination of the Rhone River and Lake Geneva. Repetitive sampling from 1964-1971 suggests that significant industrial input to the Rhone River commenced between 1965 and 1967 and has increased annually to 1971.—Copyright 1973 Bit Governed Abstracts 1972. 1973, Biological Abstracts, Inc. W73-13617

COMPARISON OF POLLUTION DEGREE OF FLUVIAL WATERS EVALUATED BY MEANS OF THE BOD5 TEST AND A SAPROBIOLOGI-

CAL METHOD, Water Economics Research Inst., Wroclaw (Poland). Water Protection Research Section.

Pol Arch Hydrobiol, Vol 18, No 4, p 381-391, 1971,

Ildentifiers: Biological studies, Biosestin, Ef-fluents, *Fluvial waters, Method, Mill, Oxygen, Pollution, *Saprobiological method, Sugar, *Po-land (Silesia), *BOD5, Biochemical oxygen de-

Investigations of 3 rivers in Lower Silesia, Poland helped establish correlations between saprobity of bioseston and biological O2 demand (BOD5) values. The correlations were different for each river, and for changing degrees of pollution they were different for the same river at different seasons. The correlations were almost identical for different rivers subject to identical or similar influences (2 rivers exposed to similarly purified sugar-mill effluents). Thus, saprobity was not an absolute and direct measure of the state of pollusugar-min etituents). Inus, saprobity was not an absolute and direct measure of the state of pollution of a river, but it was a measure of an individual reaction of biocenosis of a given river to pollution or its change. Saprobity did not hinder the comparison of 2 polluted rivers, or even the same river in different test seasons. A reaction of a set of saprobes to an increase of pollution depended on the degree of adaptation of the set to heavier concentrations of organic substances vulnerable to decomposition. The degrees of adaptation were expressed by a curve defining the relationship between saprobity and BODS. A steep slope was an evidence of a better adaptation of biocenosis. A better adaptation was expressed by a strong increase in alpha-meso and polysaprobes related to small increases of BODS in comparison with a river with nonadapted biocenosis.—Copyright 1973, Biological Abstracts, Inc.

EXPERIMENTAL INFORMATION FOR SUBSTANTIATING THE MAXIMAL PERMISSIBLE CONCENTRATION OF ISOPROPYLBENZOL HYDROGEN PEROXIDE IN BODIES OF WATER (IN RUSSIAN), Nauchno-Issiedovatelskii Institut Gigieny, Moscow (USSR).

R. D. Smirnova, and L. F. Kos'mina.

Effects of Pollution—Group 5C

Gig Sanit, Vol 36, No 12, p 17-19, 1971, English

Identifiers: *Hydrogen peroxide, Maximal per-missible concentration, *Organoleptic properties, Water pollution sources.

The threshold concentrations of isopropylbenzol hydrogen peroxide judged by its effect on the organoleptic properties of water, the general sanitaganoleptic properties of water, the general sanitary regimen, and its inefficient sanitary-toxicologic dose were determined by means of complex hygienic investigations. The smallest value of the 3 indices (0.025 mg/kg of 0.5 mg/l) is suggested as the maximum permissible concentration of isopropylbenzol in water bodies.—Copyright 1973, Biological Abstracts, Inc. W77.1469.

ON BACTERIAL AFTERGROWTH IN DRINK-ING AND INDUSTRIAL WATER: I. THE IN-FLUENCE OF ION-EXCHANGE PLANTS (IN GERMAN), Hygiene-Institut, Frankfurt am Main (West Ger-

many). Abteilung Hygiene. For primary bibliographic entry see Field 05F. W73-13629

SOLUBILITY OF MANGANESE IN THE PRESENCE OF SOIL CHEMICALS, Rhode Island Univ., Kingston.

L. K. Wang. M. S. Thesis, 1967. 110 p, 21 fig, 24 tab, 48 ref.

Descriptors: Groundwater, *Soils, Erosion, Sedimentation, *Manganese, Hydrogen Ion Concentration, Chemicals, Water pollution sources, *Solubility, *Organic acids, *Chelation.

Identifiers: Manganese monoxide, Manganese dioxide, Tartaric acid, Succinic acid, Citric acid, Acetic acid, Oxalic acid, Lactic acid, Organometallic complexes.

Organic acids, such as tartaric acid, succinic acid, citric acid, acetic acid, oxalic acid, and lactic acid, would form soluble complexes with the managanese monoxide and manganese dioxide and could therefore be partially responsible for the solution and transport of manganese in ground water. The laboratory determinations demonstrated that these six organic acids are effective chelating agents capable of complexing with man-ganese. The relative ability of these organic acids gamese. The relative admity of these organic actions to chelate with manganese to form a soluble product is in the following decreasing order: citric, acetic, oxalic, succinic, lactic, tartaric. The organometallic complexation of manganese is pH dependent. A decrease of pH will increase the level ganometanic complexation or manganese is pri de-pendent. A decrease of pH will increase the level of soluble manganese in ground water. The tem-perature effect on the solubility of manganese was measurable, but not very significant. When microorganisms are present in ground water, biological activity also influences the solubility of manganese. Generally, biochemical reduction in anaerobic ground water causes reducing condi-tions which will release manganese to solution; however, biological oxidation may render dis-solved manganese insoluble and cause precipita-tion. uon. W73-13645

5C. Effects of Pollution

STUDIES ON THE INTERACTIONS OF BAC-TERIA AND NEMATODES,

TERIA AND NEMATODES, Auburn Univ., Ala. Dept. of Botany and Microbiology. G. R. Wilt, M. M. Joshi, and J. Metcalf. Available from the National Technical Informa-tion Service as PB-222 494, \$4.25 in paper copy, \$1.45 in microfiche. Alabama Water Resources Research Institute Bulletin 10, 1973. 89 p, 30 fig, 15 tab, 11 ref. OWRR A-016-ALA (3).

Descriptors: "Nematodes, "Bacteria, "Viruses, "Bacteriophage, "Pseudomonas, Predation, Migration patterns, Oxygen requirements, Invertebrates, Microorganisms.
Identifiers: Pelodera, Vibrio, Chromobacterium, Acarbacteri

Agarbacterium

Interactions of microbes common to water resources were investigated. Nematodes were able to distinguish between food bacteria and non-food bacteria, and between bacteria and lake bottom mud. They preferentially migrated to and fed on a Vibrio species at various distances, temperatures, and pH values. Migration to food bacteria increased with an increase in bacterial concentration. Resting and dead bacteria did not attract nematodes. Nematodes migrated to food bacteria even when they had to move into areas having even when they had to move into areas having matodes. Nemanodes migrated to foot occurring even when they had to move into areas having reduced oxygen tensions or under a barrier to reach bacteria. Nematodes were not attracted by carbon dioxide. They did migrate, however, to a dialysate from food bacteria. Nematode predation resulted in greater reductions in viable numbers of bacteria than total numbers of bacteria. Interac-tions between bacteria and bacteriophage ocbers of curred under a variety of temperature and pH values. The bacterium-phage interaction seemed to be more sensitive to extremes in temperature and pH values than either associate by itself. P. and pri values than either associate by itself. F. aeruginosa in the presence of its phage utilized oxygen at a greater rate than in the absence of phage. Nematodes were observed to disseminate bacteriophage over a surface seeded with host bac-W73-13001

SULFUR BUDGET OF LAKE SHELBYVILLE, ILLINOIS, AND THE EFFECTS OF SULFIDES UPON CHAOBORUS, Illinois Univ., Urbana. Water Resources Center. For primary bibliographic entry see Field 05B. W73-13005

FACTORS CONTROLLING COPPER (II) CONCENTRATIONS IN THE KEWEENAW WATER-

CENTRATIONS IN THE REWEENAW WATER-WAY,
Michigan Technological Univ., Houghton. Dept.
of Chemistry and Chemical Engineering.
For primary bibliographic entry see Field 05B.
W73-13010

THE EFFECTS OF ENRICHMENT ON LAKE SUPERIOR PERIPHYTON, Wisconsin Univ., Eau Claire. Dept. of Allied

Health

Health.
R. R. Nelson, T. O. Odlaug, B. O. Krogstad, O. R. Ruschmeyer, and T. A. Olson.
Available from the National Technical Information Service as PB-222 498, \$5.25 in paper copy, \$1.45 in microfiche. University of Minnesota, Water Resources Research Center, Minneapolis Bulletin 99, May 1973. 182 p, 60 fig., 19 tab, 219 ref. OWRR B-020-MINN (3), 14-31-0001-3095.

Descriptors: *Periphyton, *Nutrients, *Lake Superior, Productivity, *Minnesots, Algae, *Phosphates, *Nitrates, Water pollution effects. Identifiers: Complete nutrient media, Control

Two natural rock basins were constructed at the lakeside along the north shore at Castle Danger, Minnesota for the purpose of exposing naturally grown and regrowth periphyton to higher-thanormal levels of phosphate and nitrate. At weekly intervals during 1969 and 1970, samples were colintervals during 1969 and 1970, samples were col-lected and productivity was measured by enu-meration of organisms, chlorophyll analysis, and weight (dry and organic). Lake Superior periphyton responds dramatically to increased ad-ditions of phosphorus and nitrogen. If the near-shore area of, Lake Superior ever received nutrients, such as those added to the experimental test pool at Castle Danger, a drastic change in the Lake's biota could occur. For example, as enrichment increased, the predominant clean-water diatom forms could eventually be replaced by the more tolerant green or blue-green algae. In addition, the very composition of the macrobenthic forms found in Lake Superior could be altered as a result of their dependence on the periphyton, which, as primary producers, from the first link in the food chain. Likewise, certain fish which depend on benthic organisms for their food may be adversely affected as an indirect result of a changing periphyton community. (Walton-Minnesota) W73-13011

THERMAL EFFECTS ON EGGS, LARVAE AND JUNVENILES OF BLUEGILL SUNFISH,

JUNYENILES OF BLUEGILL SUNFISH, Aquatic Sciences, Inc., Boca Raton, Fla. Arnold Banner, and Joel A. Van Arman. Copy available from GPO Sup Doc as EP1.23:73-041, \$2.10; microfiche from NTIS as PB-222 625, \$1.45. Environmental Protection Agency Ecologi-cal Research Series Report EPA-R3-73-041, May 1973. 111 p, 2 fig, 7 ab, 88 ref. EPA Contract No 14-12-913, Project No. 18050GAB.

Descriptors: *Thermal stress, *Sunfishes, *Water Descriptors: 'Internal stress, 'Santisnes, 'Water temperature, Fish reproduction, Fish eggs, Lar-vae, Growth stages, Fish juveniles, Temperature control, Fish management, Fishkill, Spawning, Aquatic environment, Water pollution effects, Thermal pollution, Bioastay. Identifiers: 'Bluegill sunfish, Fish spawning in-

Bioassay experiments were conducted to determine thermal tolerance of early life history stages of bluegill sunfish. Bluegill eggs hatched at temperatures from 18 to 36C during two incubation tests. Maximal hatch occurred at 22.2 and 23.9C. tests. Maximal hatch occurred at 22.2 and 23.9C. Lower TL50 temperature for hatch of normal fry was 21.9C and upper TL50 temperature was 33.8C. Juvenile bluegills acclimated to 12.1C had a lower 96-hour TL50 of 32.2C and an upper 96-hor TL50 of 27.5C. Juveniles acclimated to 32.9C had a lower 96-hour TL50 of 15.3C and an upper 96-hor TL50 of 37.3C. TL50 increased with increasing temperature of acclimation. For juveniles acclimated to a given temperature, upper TL50 decreased with longer exposure. A preliminary test determined ranges of thermal tolerance for sac-fry and swim-up fry. In another prelinary test, juvenile bluegills were acclimated to 12.1, 19.0 26.0 or 32.9C, and reared at a series of test temperaor 32.9C, and reared at a series of test tempera-tures for three to six wks. to define optimal temperature ranges for growth and survival. Additional research determined conditions for the culture of Lepomis macrochirus, including spawning induction, hatching, and growth of larvae and juveniles. (EPA)
W73-13020

EFFECTS OF COPPER ON THE LOCOMOTOR

ORIENTATION OF FISH, Texas A and M Univ., College Station. Dept. of

Texas A and M Univ., College Station. Dept. of Biology.

H. Kleerekoper.
Copy available from GPO Sup Doc as EP1.23:73-045, \$1.45. Environmental Protection Agency, Ecological Research Series Report EPA-R3-73-045, June 1973, 97 p, 18 fig, 10 tab, 54 ref. EPA Project 18050 DWQ. R800995.

Descriptors: Channel catfish, Suckers, Sunfishes, Bass, *Copper, Fish, Water temperature, Ions, Fish behavior, Water pollution effects, Gradients

Identifiers: Goldfish, White sucker, Green sunf-ish, Lepomis cyanellus, Carassius auratus, Micropterus salmoides, *Fish locomotion, Avoidance behavior (Fish).

The effects of copper ions at subacute concentra-tions on the locomotore orientation of goldfish (Carassius auratus), channel catfish (Ictalurus

Group 5C-Effects of Pollution

punctatus), largemouth bass (Micropterus sal-moides), white sucker (Catostomus commersoni commersoni) and green sunfish (Lepomis cyanne-lus) were investigated in detail. In regions of water containing 11-17 micrograms/1 Cu++ (as CuCl2) in a shallow gradient goldfish oriented toward the copper source ('attraction'). This response is reduced in a somewhat steeper gradient. In steep gradients in the commercial control of the control of th copper source ('attraction'). This response is reduced in a somewhat steeper gradient. In steep gradients significant but no absolute avoidance behavior occurred. Whether the response will be 'avoidance' or 'attraction' seems to depend on the slope of the gradient to which the fish is exposed. Even in steep gradients, the 'avoidance' behavior is reversed to 'attraction' when the copper ions interact with a temperature slightly higher (AC) than that of the surrounding copper free water. The interaction creates a new stimulus configuration which is different from those formed by the two teraction creates a new stimulus configuration which is different from those formed by the two variables separately. The orientation of the largemouth bass is not affected by copper ions at the concentrations tested. Channel catfish are weakly attracted by the copper-containing water and green sunfish significantly increase time spent there. Suckers significantly but not absoletely 'avoid' such water through changes in turning behavior (RPA) behavior. (EPA) W73-13021

INTERACTION BETWEEN MARINE ORGAN-ISMS AND OIL POLLUTION, Woods Hole Oceanographic Institution, Mass. M. Blumer, J. M. Hunt, J. Atema, and L. Stein. Copy available from GPO Sup Doc as EPI 23:73-042, \$1.25; microfiche from NTIS as PB-222 628, \$1.45. Environmental Protection Agency, Ecological Research Series EPA-R3-73-042, May 1973. 97 p, 18 fig, 5 tab, 11 ref. EPA Project 18080 EBN and 10850 EBN.

Descriptors: Behavior, *Oil wastes, Analytical techniques, Gas chromatography, *Degradation (Decomposition), *Path of pollutants, *Lobsters, *Organic compounds, *Oil pollution, Water pollution effects, Water pollution sources.

Part I of this project has established that fossil hydrocarbons can be distinguished from biogenic hydrocarbons in living organisms. Hydrocarbons are stable in marine organisms and sediments and can move unaltered through several trophic levels. Only very low levels of organic stimuli are necessary for chemical communication—a mechanism execution. especially prone to interference by pollutants. Part II has established that a low level of crude oil (0.9 milliliters/liter) interferes with the timing of feed-ing behavior in the lobster (Homarus americanus). Water soluble fractions (in the 50 ppb range) did not affect feeding behavior. Added oil reduced the lipids as well as alkane and alkene-aromatic connumber of water as an annear and ancerearomatic content of aquaria. Degradation of added oil followed the usual pathways of evaporation, dissolution, oxidation, polymerization, and metabolism. (EPA) W73-13023

ACUTE EFFECTS OF ADMINISTRATION OF METHYL MERCURIC CHLORIDE ON TISSUES AND ENZYME ACTIVITY IN CHANNEL CAT-FISH (ICTALURUS PUNCTATUS), Louisville Univ., Ky. Dept. of Anatomy.

M. W. Kendall.

PhD Dissertation, May 1972. 101 p, 39 fig, 2 tab, 35 ref. OWRR-A-038-KY (2).

Descriptors: *Mercury, *Catfishes, *Water pollution effects, *Pathology, *Toxicity, Public health, Fish management, Fish farming, Enzymes, Fish, Inhibitors.

Identifiers: *Methyl mercury, Fish physiology.

In Kentucky and neighboring southeastern states, the channel catfish is being extensively cultured as a food crop. Acute exposure to methyl mercuric chloride causes enzyme and tissue alterations. The principal reaction of absorbed mercury is to bind thiols, forming mercury mercaptide. The ultimate

effect of mercury and its compounds is based upon its ability to inhibit enzymes. In the channel catfish, a single intraperitoneal injection of 15 mg/kg methyl mercuric chloride caused deposition of mercury in liver, kidney, skeletal muscle, and of hercury in liver, additional more gill. Marked pathology was evidenced by necrosis in the liver, necrosis of pancreatic tissue within portal venous walls, necrosis of renal tubular cells in the liver, necrosis of pancreatic tissue within portal venous walls, necrosis of renal tubular cells and marked thickening of renal glomerular basement membrane. The principal effects on eazymes were facilitation of acid phosphatase, alkaline phosphatase, and leucine aminopeptidase and inhibition of succinic dehydrogenase and oxygen consumption. A lower dosage of 1.5 mg/kg methyl mercuric chloride produced no structural alterations but did produce changes in enzyme activity tions but did produce changes in enzyme activity. These alterations in tissues and enzyme activity are indicative of acute methyl mercuric chloride intoxication in the channel catfish. (Knapp-USGS)

AQUATIC ORGANISMS AND HEAVY METALS IN MISSOURI'S NEW LEAD BELT, Missouri Univ., Rolla. N. L. Gale, B. G. Wixson, M. G. Hardie, and J. C.

Water Resources Bulletin, Vol 9, No 4, p 673-688, August 1973. 6 fig, 6 tab, 11 ref.

Descriptors: *Lead, *Mining, *Mine wastes, *Food chains, *Water pollution effects, Path of pollutants, Algae, Aquatic animals, *Missouri, Fish, Snails, Crayfish, Heavy metals. Identifiers: *New Lead Belt (Mo).

The New Lead Belt of southeastern Missouri has recently become the largest lead producing region of the world. Since the industrial development began, there have been a number of nuisance began, there have been a number of nuisance biological blooms in several of the small streams receiving effluent from the mines and mills. The major constituents of the problem algal growths include Cladophora, Oscillatoria, Mougeotia, Zygnema, Spirogyra, Cymbella, and a variety of other stalked and nonstalked diatoms. Secondary blooms of Sphaerotilus reach problem proportions in some streams, particularly in the autumn. Finely ground rock flour and mineral particles escaping from tailings dams are trapped by the stream vegetation. Concentrations of lead, zinc, copper, and manganese in the algal and bacterial mats are inversely related to distance downstream from the tailings dams. Consumer organisms, including tailings dams. Consumer organisms, including crayfish, snails, aquatic insects, tadpoles, min-nows and larger sunfish, were analyzed to deter-mine the extent of dissemination and concentration of heavy metals through food chains. Insignificant concentrations of heavy metals were found in the consumer organisms studied, though in at least one problem stream the normal con-sumer organisms were markedly reduced in num-bers. (Knapp-USGS) W73-13037

EXTENSIVE OXYGEN DEPLETION IN MO-BILE BAY, ALABAMA, Alabama Marine Resources Lab., Dauphin Island.

E. B. May.

Limnology and Oceanography, Vol 18, No 3, p 353-366, May 1973. 5 fig, 1 tab, 33 ref.

Descriptors: *Estuaries, *Oxygen sag, *Water pol-lution effects, *Density stratification, *Alabama, Salinity, Dissolved oxygen, Anaerobic conditions, Biochemical oxygen demand, Eutrophication, Organic wastes, Waste assimilative capacity. Identifiers: "Mobile Bay (Ala).

Extensive areas of bottom water in Mobile Bay, Extensive areas of bottom water in Mobile Bay, Alabama, suffer oxygen depletion in summer because of salinity stratification. When these water masses low in dissolved oxygen are occa-sionally forced against the beach, demersal fish and crustaceans migrate shoreward in a depressed or moribund state. In the absence of technical

data, these occurrences, locally called jubilees, provide over a century of historical evi provide over a century of historical evidence of oxygen depletion. Oxygen depletion and jubilees occurred in the bay before man physically modified the basin, but the conditions responsible for oxygen depletion are now worse than in the past. Because of bathymetric changes and modifications which have restricted water circulation. Mobile Bay has exceeded its capacity to assimilate its oxygen demand in summer. This has severely affected the biota of the estuary. (Knapp-USGS) W73-13065.

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AN AQUARIUM TEMPERATURE CONTROL SYSTEM FOR FIELD STATIONS,

New York Cooperative Fishery Unit, Ithaca. H. A. Regier, and W. H. Swallow. Progressive Fish Culturist, p 43-46. January, 1968, 2 fig, 1 tab, 2 ref. OWRR-A-013-NY (3).

Descriptors: *Temperature control, *Aquaria, *Fish handling facilities, Equipment, Research facilities, Laboratories, Automatic control.

An automated and rugged system of temperature controlled aquaria was set up to maintain a temperature range within 0.5C. The system is capable of maintaining constant temperature and programmed temperature changes, Methods, type and brand of equipment and precautions are given. (Ir-win-Cornell) W73-13079

EFFECTS OF INCUBATION TEMPERATURE ON SURVIVAL OF LARGEMOUTH BASS

Cornell Univ., Ithaca, N.Y. Dept. of Conserva-

J. W. Kelley. Progressive Fish Culturist, p 159-163. July, 1968, 1 tab, 9 ref. OWRR-A-013-NY (6).

Descriptors: *Largemouth Bass, *Temperature, Thermal pollution, *Fish eggs, Incubation, Water pollution effects, *Thermal stress.

Largemouth Bass eggs were taken from a natural environment and subjected to varying intensities of temperature shock. Survival was highest between 55 and 75F, generally lower at 50 degrees and 80 degrees, and lowest at 85F. The percentage of hatch of eggs acclimated to 50 degrees, 80 degrees and 85F was generally much higher than the percentages for non-acclimated eggs incubated at those temperatures. (Irwin-Cornell) W73-13080

FOOD OF LARGEMOUTH BASS (MICROP-TERUS SALMOIDES) FROM A SOUTH CAROLINA RESERVOIR RECEIVING HEATED

Virginia Cooperative Fishery Unit, Blacksburg. D. H. Bennett, and J. W. Gibbons. Trans Am Fish Soc. Vol 101, No 4, p 650-654,

Identifiers: Bass, Effluents, Heated water, *Largemouth bass, Lepomis-Sp, Micropterus-Salmoides, Reservoirs, *South Carolina, *Thermal

Largemouth bass (Micropterus salmoides) col-lected from an area of a South Carolina reservoir at ambient temperatures contained greater amounts of food than bass taken at the entrance of a heated effuent in the same reservoir. Unidentifi-able fish occurred in the highest frequency at both areas; sunfish (Lepomis sp.) had the highest frequency of occurrence of all identifiable items. All major dietary components were found in All major dietary components were found in stomachs of bass from both areas from March stomacus of Dass from boun areas from hands through May although the relative occurrences of these items varies in the winter, spring, and fall. Increased metabolic requirements on fish living in the heated portion of the reservoir, are possibly

reduced by individuals entering the waters at ex-treme temperatures to feed, followed by move-ment to deeper, stratified waters at lower tempera-tures.—Copyright 1973, Biological Abstracts, Inc. W73-13083

SLIME PRODUCTION BY PSEUDOMONAS AERUGINOSA. II. A NEW SYNTHETIC MEDI-UM AND CULTURAL CONDITIONS SUITABLE SLIME PRODUCTION

FOR SLIME PRODUCTION BY PSEU-DOMONAS AERGINOSA, Toho Univ., Tokyo (Japan). School of Medicine. S. Goto, T. Murakawa, and S. Kuwahara. Japanese Journal of Microbiology, Vol 17, No 1, p 45-51, January 1973. 8 fig, 2 tab, 13 ref.

Descriptors: *Nutrient requirements, *Growth rates, *Slime, Cultures, Pseudomonas, Pathogenic rates, *Slime, Cultures, Pseudomonas, Pathogenic bacteria, Viscosity. Identifiers: *Pseudomonas aeruginosa, Culture

Using Pseudomonas aeruginosa culture IFO 3445, Using Pseudomonas aeruginosa culture IFO 3445, the nutritional requirements and cultural conditions suitable for slime production were investigated. A synthetic medium was established from the experimental results, which was composed of sodium glutamate, glucose, phosphate and magnesium salt. When a cellophane plate method was used, incubation at 37C for 3 days produced the highest relative viscosity. In the messence of an oxidizable carbohydrate the relaproduced the nignest relative viscosity. In the presence of an oxidizable carbohydrate the rela-tive viscosity of the culture fluid was reduced with the acid reaction, and recovered if the reac-tion was adjusted to pH 7-8. (Little-Battelle) W73-13088

THE VERTICAL DISTRIBUTION OF SOME CILIATED PROTOZOA IN THE PLANKTON OF A EUTROPHIC POND DURING SUMMER

STRATIFICATION, Durham Univ. (England). Dept. of Botany.

R. Goulder. Freshwater Biol. Vol 2, No 2, p 163-176. 1972. II-

lus. Identifiers: *Ciliated protozoa, Distribution pat-terns, England, *Eutrophic pounds, Loxodes-magnus, Loxodes-striatus, Photosynthesis, Phytoplankton, Ponds, Protozoa, Stratification, Summer, *Vertical distribution.

The vertical distribution of some ciliated Protozoa in the plankton of a pond in northwest England was investigated during Aug. 1971. At this time, when the pond was stratified with an O2 deficient when the pond was stratified with an O2 deficient hypolimnion, ciliates were counted at 10-cm depth intervals every 5 hr over 25 hr. The most common species (Loxodes magnus and L. striatus) were confined to the hypolimnion; there was no diurnal migration into the epilimnion. Earlier work had shown that Loxodes species required O2; it is therefore possible that these ciliates, which inhabited the O2 deficient hypolimnion, migrated vertically, from time to time, to an O2 supply at the boundary with the well-oxygenated epilimnion. To test this, Loxodes populations were confined in cellophane tubes both in the hypolimnion (at 3 m) and epilimnion (0.5 m) for 12 and 24 hr (earlier trials had shown that the tubes were not markedly als had shown that the tubes were not markedly toxic). The ciliates died at both depths, and in a toxic). The ciliates died at both depths, and in a further experiment when Loxodes were confined at 3 m and 0.5 m and sampled at 5-hr intervals up to 25 hr it was found that they survived longer in the hypolimnion. It is suggested that ciliates confined at 3 m died because they were unable to migrate vertically to an 02 supply, while those at 0.5 m died because some other adverse factor was operating in the epilimnion. Laboratory experiments showed that Loxodes died in water in which polytoplankton photosynthesis took place and it is phytoplankton photosynthesis took place and it is suggested that side effects of photosynthesis in the epilimnion (e.g., a rise in pH) caused the death of ciliates exposed at 0.5 m.—Copyright 1973, Biological Abstracts, Inc. W73-13101

ECOLOGICAL OBSERVATIONS ON THE EMERGENCE OF CERCARIAE FROM GONIOBASIS FLORIDENSIS REEVE FROM GONIOBASIS FLORIDENSIS REEVE FROM THE WEKIVA RIVER, FLA., Santa Fe Junior Coll., Gainesville, Fla. G. W. Hunter, III, and E. E. Wigington. Ecology. Vol 53, No 5, p 901-907, 1972. Illus. Identifiers: "Cercariae, Ecological studies, "Florida (Wekiwa River), Goniobasis-floridensis,

An 18 mo, study of the infection of G. floridensis from the Wekiva River in south-central Florida revealed that overall infection peaks appear to occur in Dec. and then again in the spring (Feb-May). A total of 3149 specimens of G. floridensis were examined for emerging cercariae with an overall prevalence rate of 5.1%; 9% of 789 snails from station 1 and 3.8% of 2369 snails from station 2 were positive. At station 1 xiphidiocercariae were present in all 6 of the collections, strigeids in 5, neleurolophocercous in 4, and cysticercariae in 2. were present in all 6 of the collections, strigeids in 5, pleurolophocercous in 4, and cysticercariae in 2. At station 2 the pleurolophocercous cercariae occurred in 9 collections, xiphidio in 8, strigeid in 7, and echinostome and cysticercariae in 1 each. When totals are considered, xiphidiocercariae were the most abundant, occurring in 14 collections compared with the pleurolophocercous in 13, strigeids in 12, cysticercariae in 1. Multiple infections occurred only twice: 1 snail shed 2 species of xiphidiocercariae and the other, xiphidiocercariae and pleurolophocercous cercariae. Such items as pH, dissolved O2, temperature of the water, and so forth showed no particular correlation with the so forth showed no particular correlation with the overall cercarial shedding pattern.—Copyright 1973, Biological Abstracts, Inc.

PESTICIDES, POLLUTION, AND FOOD

SUPPLY, Cornell Univ., Ithaca, N.Y. Dept. of Entom For primary bibliographic entry see Field 05G. W73-13104

COMPETITION FOR UREA ESTUARINE MICROORGANISMS, **AMONG** Woods Hole Oceanographic Institution, & C. C. Remsen, E. J. Carpenter, and B. W.

Schroeger. Schroeger. Vol 53, No 5, p 921-926. 1972. Illus. Identifiers: Asterionella, Bacteria, Chaetoceros, Chlorophyli, *Estuarine microorganisms, Pollution, Rhizosolenia, Salinity, Thalassiosira, *Urea decomposition, Phytoplankton, *Georgia.

Phytoplankton were responsible for the major part the urea decomposition in the Savannah-lmington-Ogeechee estuaries and adjacent Wilmington-Ogecchee estuaries and adjacent coastal waters in Georgia. This is an exception to the general rule that bacteria are favored over algae in the competition for dissolved organic compounds. Filtration of estuary water through a 20 micro mesh filter did not significantly change the concentration of urea-decomposing bacteria; there was, however, a significant change in phytoplankton cell concentrations, chlorophyll a, and urea decomposition rates. Thus, any differences in the decomposition of urea in filtered and unfiltered aliquots could be attributed to the phytoplankters removed by filtration. Average cell phytoplankters removed by filtration. Average cell concentrations and chlorophyll a removed by filtration were 15% and 39% of the totals, respectively. The removal of urea-composing activity averaged 53% of the total. This indicates that the averaged 53% of the total. This indicates that the phytoplankters removed by filtration, mainly diatoms with large cross-sectional areas such as Rhizosolenia, Chaetoceros, Asterionella, Thalasiosira, etc., were responsible for proportionally higher amounts of urea decomposition than would be indicated on a purely cell-numbers basis. Urea concentrations ranged from 0.6 to 8.9 micrometer, with the highest values (average 3.41 micrometer) being found in the more polluted Savannah estuary. Lower values, generally 1-2 micrometer, were observed in the Wilmigton and Ogeechee estuaries. Fresh water generally had slower urea decomposition rates (average of 6.2 micrometer-moles liter-1 hr-1) than brackish waters (average 19.6 micrometermoles liter-1 hr-1). Turnover time for urea, calculated from these average values, was 25 days for fresh water and 4 days for brackish water.—Copyright 1973, Biological Abstracts, Inc. W73-13108

THE CONTROL OF PH AND TOTAL AL-KALINITY OR TOTAL CARBONATE IN AQUATIC BIOASSAYS, Michigan Univ., Ann Arbor. Dept. of Environ-mental and Industrial Health. R. F. Roberts, and H. E. Allen. Trans Am Fish Soc. Vol 101, No 4, p 753-756.

Identifiers: *Alkalinity, *Bioassays, *Carbonates, Metals, Toxicity, Water pollution, Hydrogen ion

Basic chemical equilibrium concepts are employed to develop a method for precise control of pH and total alkalinity or total carbonate for use in bioassay studies. By precision control of these variables along with control of other variables, e.g., temperatue, hardness, dissolved O2, and dissolved organics, determination of the quantitative effects of these variables on the toxicity of heavy metals is possible.—Copyright 1973, Biological Abstracts, Inc.

EPIDEMIOLOGICAL STUDY ON CLONORCHIS SINENSIS AROUND LAKE BIWA, SHIGA PREFECTURE: IL SURVEY ON METACERCARIA INFECTION IN FRESH-WATER FISHES AND ON HUMAN INFECTION WITH THIS PARASITE, (IN JAPANESE), Kyoto Prefectural Univ. of Medicine (Japan).

Dept. of Medical Zoology.

M. Nagahana, Y. Yoshida, K. Matsuo, K. Kondo, and K. Matsuno.

Jap J Parasitol. Vol 20, No 6, p 499-506. 1971. Illus.

English summary.
Identifiers: Acheilognathus-lanceolata, Acheilognathus-rhombea, Biwia-zezera, *Clonorchis sinensis, Epidemiological, Fishes, Gnathopogon *Clonorchiselongatus-caerulescens, Gnathopogon-elongatus-elongatus, Human, Infection, Japan (Lake Biwa), Lakes, *Metacercaria, Parasites, Pseudorasbora-parva, Rhoduns-ocellatus-mithi, Sarcocheilichthys-variegatus.

During 1962-1970, 715 freshwater fishes were examined for metacercaria of C. sinensis. Those fishes were collected from 13 stations around the Lake Biwa. The metacercarial infection was found in 8 species of the fishes out of 19 species exin 8 species of the fishes out of 19 species ex-amined, those were Pseudorasbora parva, Sar-cocheilichthys variegatus, Rhoduns ocellatus smithii, Gnathopogon elongatus elongatus, G. elongatus caerulescens, Acheilognathus rhombea, A. lanceolata and Biwai zezera. The infection in-cidence was generally high in those collected from southern part of the lake, e.g. in station 9, 92 out of 150 P. press were infected with the metacracia-150 P. parva were infected with the metacercaria. The stool examination of man was carried out at 11 villages or towns around the lake using HCI-ethanol concentration technique between 1963 and 1966. The egg of C. sinensis was detected in 190 out of 1945 examination (1960). out of 1645 examined (11.6%). The infecti was very low in northern parts (A and B) of the lake. It was considerably high in other parts, usually between 10-20% and in some villages more usually between 10-20% and in some villages more than 20%, with one exception of village K which showed 4.3%. Although the infection rate was markedly high in adult age group, the fact that 3.4% of children less than 10 yr old were positive for ova suggested the possibility of recent infections.—Copyright 1973, Biological Abstracts, Inc. W73-13112

Group 5C-Effects of Pollution

A COMPARISON OF THE ZOOPLANKTON COMMUNITIES IN SEVEN MOUNTAIN LAKES NEAR LILLEHAMMER, NORWAY (1896 AND

1971), Norsk Institutt for Vannforskning, Blindern.

Norsk Institut for Vannorsking, Banderii.
A. Langeland.
Norw J Zool. Vol 20, No 3, p 213-226. 1972. Illus.
Identifiers: Biomass, Fish, Lakes, *Norway
(Mesna catchment), *Phytoplankton, Pollution,
*Zooplankton.

During April, June and Aug 1971 phytoplankton and zooplankton investigations were performed in 7 mountain lakes in the Mesna catchment area near Lillehammer, Norway, and the results comnear Lillehammer, Norway, and the results compared with earlier plankton investigations in 1896 (Huitfeldt-Kans 1906). The great biomass of phytoplankton and zooplankton indicates lakes with relatively high primary and secondary production. It is assumed that this is mainly caused by natural conditions. The high ratio between phytoplankton and zooplankton biomass in some of the lakes indicates an unstable ecological equilibrium state. The qualitative and quantitative changes in the plankton community during the last 75 yr are assumed to have been caused by heavy fish predation, impoundment and pollution.—Copyright 1973, Biological Abstracts, Inc. W73-13117

EFFECTS OF DDT UPON SALMON FROM SCHOODIC LAKE, MAINE, Maine Dept. of Inland Fisheries and Game, Au-

gusta.
D. O. Locke, and K. Havey.
Trans Am Fish Soc. Vol 101, No 4, p 638-643.

Identifiers: Blueberry, *DDT, Lakes, *Maine (Schoodic Lake), *Salmon, Synergistic effect, Water pollution effects.

Schoodic Lake, a relatively large glacial kettle located in the blueberry growing area of Washington County, Maine, is in a section where pesticides have been used intensively in blueberry culture for many years. DDT was implicated as the cause of a high hatchery mortality of landlocked salmon eggs and fry from Schoodic Lake in 1968-1969. This implication prompted a controlled study in 1970 to determine more exactly the effects of the pesticide. plication prompted a controlled study in 1970 to determine more exactly the effects of the pesticide upon salmon eggs and fry with Schoodic Lake as the parental source. DDT and metabolites in salmon eggs and fry from Schoodic Lake ranged from 7.21 to 10.41 ppm as opposed to 0.28 to 1.31 ppm in control fish from West Grand Lake. The Schoodic lot had a total mortality to feeding of 66% as opposed to a 30% mortality in the West Grand Lake fish. DDT and metabolites in mature salmon from Schoodic Lake in fall, 1969 ranged from 4.03 to 12.22 ppm in contrast to a range of 0.11 to 1.03 ppm in mature salmon from West Grand Lake. DDT and metabolites in mature salmon from Schoodic Lake in fall, 1970 ranged from Schoodic Lake in fall, 1970 ranged from Schoodic Lake in fall, 1970 ranged from Grand Lake. DDT and metabolites in mature samon from Schoodic Lake in fall, 1970 ranged from 3.40 to 8.76 ppm. The increased use of guthion, an organophosphate, in the Schoodic Lake area may have a detrimental syncripsite effect with DDT upon fish.—Copyright 1973, Biological Abstracts, len Inc. W73-13120

THE EFFECTS OF METHOXYCHLOR ON FISHES: I. ACUTE TOXICITY AND BREAK-DOWN STUDIES, Michigan Dept. of Natural Resources, Ann Arbor. Inst. for Fishery Research. J. W. Merna, M. E. Bender, and J. R. Novy. Trans Am Fish Soc. Vol 101, No 2, p 298-301.

Identifiers: *Fathead minnows, Fish, *Methox ychlor, Perch, *Toxicity (Acute), Wetting, *Yellow perch.

The rate of breakdown of methoxychlor (a DDT substitute) in water varies considerably with the water source. The half life attributable to hydroly-

sis in distilled water exceeds 200 days; the half life may be as short as I day in water of high biological activity. Static toxicity studies were unreliable due to the rapid breakdown of methoxychlor. Continuous flow studies yielded TL50 (median tolerance limit) values of 7.5 micrograms/I for fathead minnows and 20 micrograms/I for yellow perch. These values are considerably lower than others in the literature. The difference is probably due to the literature. The difference is probably due to the use of a wetting agent to achieve better solution of methoxychior.—Copyright 1973, Biological Abstracts, Inc. W73-13122

PRODUCTIVITY AND DISTRIBUTION OF TRICHOPTERA LARVAE IN A COLORADO MOUNTAIN STREAM, Southern Methodist Univ., Dallas, Tex. Dept. of

Biology. For primar W73-13124 ary bibliographic entry see Field 02I.

TRENDS IN METHODOLOGY FOR EVALUA-TION OF EFFECTS OF POLLUTANTS ON MARINE ORGANISMS AND ECOSYSTEMS, Fisheries Research Board of Canada, West Van-couver, (British Columbia). Pacific Environment Inst. M. Waldichuk

CRC-Critical Reviews in Environmental Control, Vol 3, No 2, p 167-211, February 1973. 2 fig, 3 tab, 378 ref.

Descriptors: On site investigations, "Analytical techniques, "Methodology, Evaluation, "Water pollution effects, "Ecosystems, "Reviews, "Pollutant identification, Bioassay, Laboratory tests, Marine fish, Cold-water fish, Animal physiology, acquisitions of the control of the c Marine fish, Cold-water fish, Animal physiology, Primary productivity, Secondary productivity, Laboratory equipment, Instrumentation, Growth stages, Marine algae, Marine bacteria, Crustaceans, Mollusk, Marine animals, Inver-tebrates, Toxicity, Lethal limit, Animal behavior, Solvent extractions, Ion exchange, Colorimetry. Identifiers: Pollutant effects, Marine environ-ment Mercinyertebrates Binecompulation Data neent, Macroinvertebrates, Bioaccumulation, Data interpretation, Median tolerance limit, Electrolytic extraction, Acclimation, Petroleum hydrocarbons, Scuds, Steelhead trout, Sockeye salmon, White sucker, Species diversity, Most probable number test, Ion exchange chromatography, Gas liquid chromatography, Adsorption chromatography, Thin layer chromatography, Paper chromatog-raphy, High pressure liquid chromatography, Liquid-liquid extraction.

The literature related to biological and chemical methodology for evaluating the effects of pollutants on marine organisms is reviewed. Research findings are considered from the very pragmatic point of view and the review is an extension of the presentation on the subject made earlier. In this case, it does not cover in depth broader considerations of physiological and biochemical studies on the effects of pollutants on marine organisms, from which there is an ever-increasing literature. Also, much of the microbiological research on marine pollution has been largely unreviewed. (Mortland-Battelle)

AVOIDANCE OF PESTICIDES BY GRASS SHRIMP (PALAEMONETES PUGIO), Environmental Protection Agency, Gulf Breeze, Fla. Gulf Breeze Lab. D. J. Hansen, S. C. Schimmel, and J. M. Keltner

Bulletin of Environmental Contamination and Toxicology, Vol 9, No 3, p 129-133, March 1973. 3 tab, 6 ref.

Descriptors: *DDT, *Endrin, *2 4-D, Bioassay, Animal behavior, *Pesticide toxicity, Water pollu-tion effects, Crustaceans, Chlorinated hydrocar-

bon pesticides, Phosphothioate pesticides, Carba-mate pesticides, "Shrimp. Identifiers: "Dursban, "Malathion, "Sevin, Avoidance, Palaemonetes pugio, Grass shrimp, Macroinvertebrates, Median tolerance limit.

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Macroinvertebrates, Median tolerance limit.

The capacity of the euryhaline grass shrimp, Palaemonetes pugio, to avoid water polluted by DDT, endrin, Dursban, malathion, Sevin, or 2,4-D was evaluated. Grass shrimp were sieved from ponds and acclimated for at least 5 days in the laboratory at 20 percent salinity and 20 C. Avoidance was tested by allowing the shrimp to move from a holding area into one of two section, one with pesticide polluted water and the other with unpolluted water. Light was excluded during experiments. It was assumed, and corroborated in preliminary tests, that in the absence of pollutants the shrimp would enter the two areas with equal frequency. Chi-square tests were used to analyze the results. The shrimp avoided 1) and 10.0 ppm concentrations of the herbicide 2,4-D but did not avoid any of the five insecticides. Given a choice between two concentrations of 2,4-D, they chose the lower concentration. The data suggest that shrimp may be extremely vulnerable to pesticide pollution because they are very sensitive to pesticides and are unlikely to avoid water polluted by them. (Mortland-Battelle) W73-13173 W73-13173

INORGANIC NITROGEN REMOVAL FROM WASTEWATER: EFFECT ON PHYTOPLANK-GROWTH IN COASTAL MARINE

TON GROWIN WATERS,
Woods Hole Oceanographic Institution, Mass.
J. C. Goldman, K. R. Tenore, and H. I. Stanley.
Science, Vol 180, No 4089, p 955-956, June 1, 1973. 1 fig, 1 tab, 9 ref.

Descriptors: "Nitrogen, Waste water treatment,
"Phytoplankton, Growth rates, "Bioassay, Marine
algae, "Tertiary treatment, "Nutrient removal, Sea
water, Nutrient requirements, Nutrients, Ponds,
Eutrophication, Phosphorus, Limiting factors,
Water pollution control, Efficiencies,
Chrysophyta, Plant growth.
Identifiers: Pollutant removal, "Algal growth
potential, Coastal waters, Chaetoceros simplex.

Algal bioassays were used to demonstrate the high efficiency of a combined tertiary wastewater treat-ment and marine aquaculture system in removing ment and marine aquaculture system in removing inorganic nitrogen, and to show that the coastal waters off Woods Hole, Massachusetts, are limited in nitrogen for marine phytoplankton growth. When nutrients were removed from secondarily treated domestic wastewater through assimilation by phytoplankton in an outdoor growth pond, the pond effluents, in varying dilutions with seawater, could not support more phytoplankton growth than the seawater alone. However, when nitrogen was added back to the mixtures of pond effluent and seawater, the phytoplankton growth response was similar to that with a mixture of wastewater and seawater. This is similar to the findings of other researchers, and similar to the findings of other researchers, and suggests that nitrogen may be the key growthiting nutrient in many coastal mari imiting nutrient in many coastal manne waters. The combined tertiary treatment-marine aquaculture system appears to be an effective means of removing nitrogen from secondarily treated wastewater and controlling eutrophication of coastal marine waters. (Mortland-Battelle) W73-13179

BENTHIC MACROINVERTEBRATE COMMU-NITY STRUCTURE IN A GREAT PLAINS STREAM RECEIVING FEEDLOT RUNOFF. Kansas State Teachers Coll., Emporia.
C. W. Prophet, and N. L. Edwards.
Water Resources Bulletin, Vol 9, No 3, p 583-589,

72

Descriptors: *Feed lots, *Benthic fauna, Biologi-Descriptors: "Feed lots, "Benthic fauna, Biologi-cal communities, Water quality, Mollusks, Oligochaetes, Gastropods, Biomass, Clams, Aquatic insects, Annelids, "Farm wastes, Water sampling, Mayflies, Caddisflies, Midges, Water sampling, Mayflies, Caddisflies, Midges, Water beetles, Systematics, Diptera, Invertebrates, Dominant organisms, Organic matter, Kansas, Fountions.

Equations.
Identifiers: *Species diversity index, *Feedlot runoff, *Macroinvertebrates, Data interpretation, Leeches, Turbellaria, Species diversity, Recovery, Repopulation, Cottonwood River, Bugs, Sphaerium, Isonychia, Paraleptophlebia, Hydropsyche, Cheumatopsyche, Stenelmis, Fin-gernail clam, Black flies, Ameletus, Caenis, Potamyia, Hydroptilia, Ithytrichia, Chironomus, Polypedilum, Simulium, Moths, Alderflies, Dam-selflies.

The effect of feedlot runoff on the environmental quality of the Cottonwood River in east central Kansas was evaluated by analysis of community structure of benthic macroinvertebrates using the source to be made macroinvertebrate using the species diversity index, (d bar). The benthic fauna along the study reach was dominated by mayflies, caddisflies, midges, riffle beetles, and the pelecypod, Sphaerium. Sixty-five taxa were identified during the study; the benthic fauna was most abundant during the 1968-69 segment of the study. However, the mean species diversity index study. However, the mean species diversity index per station indicated the river was subject to moderate environmental stress, and species diver-sity indices of those stations immediately downstream from feedlots were significantly lower than the species diversity index at the control station. There was a significant increase in species diversity indices during the 1970-71 segment of the study, following the closing of two feedlots. The results indicate periodic feedlot runoff had a continuing adverse effect on the environmental quality of the river, but recovery was rapid as the organic load on the river was reduced. (Mortland-Battelle) W73-13180

EPOXIDATION AND FATE OF (C-14)ALDRIN IN INSECTICIDE-RESISTANT AND SUSCEPTI-BLE POPULATIONS OF MOSQUITOFISH (GAMBUSIA AFFINIS), Mississippi State Univ., State College. Dept. of

Zoology. nary bibliographic entry see Field 05B.

SOME PROCEDURES FOR ISOLATING TOXIC METABOLITES OF PHOSPHOROTHIONATE PESTICIDES FROM ANIMAL TISSUES AND

Ministry of Agriculture, Fisheries and Food, Weybridge (England). Central Veterinary Lab. For primary bibliographic entry see Field 05A. W73-13196

A LITERATURE SURVEY OF OCEAN POLLU-TION, Catholic Univ. of America, Washington, D.C. Inst.

of Ocean Science and Engineering.
For primary bibliographic entry see Field 05B.
W73-13211

CORROSION AND SCALING IN NUCLEAR-STIMULATED GEOTHERMAL POWER

California Univ., Livermore. Lawrence Livermore Lab ary bibliographic entry see Field 08H. For primar W73-13231

GLUCOSE FLUX AT THE SEDIMENT-WATER INTERFACE OF TORONTO HARBOUR, LAKE ONTARIO, WITH REFERENCE TO POLLU-

Toronto Univ. (Ontario). Dept. of Zoology. For primary bibliographic entry see Field 05B. W73-13236

INFLUENCE OF SULFITE ON GROWTH, SLIME, AND FLUORESECENT PIGMENT FOR-MATION BY PSEUDOMONAS AERUGINOSA, Eastern Regional Research Lab., Philadelphia, Pa. S. A. Palumbo.

Canadian Journal of Microbiology, Vol 19, No 4, p 505-511, April 1973. 2 fig, 4 tab, 21 ref.

Descriptors: *Cultures, *Pigments, *Growth rates, *Water pollution effects, *Sulfur compounds, Iron, Slime, Incubation, Hydrogen ion concentration, Temperature, Nutrients, Turbidity, Environmental effects.

*Pseudomonas aeruginosa, *Sulfites, *Bacterial physiology, Fluorescent pigments, Culture media, Pyocyanine, Bisulfites.

Substitution of sulfite for sulfate in the defined pyocyanine medium of Frank and DeMoss 1959 allowed formation of fluorescent pigments and slime by Pseudomonas aeruginosa NRRL B-4014. This by Pseudomonas aerugmosa NRKL B-4014. This formation of fluorescent pigments was both pH and iron dependent. The unadjusted medium (pH 8.25) containing sulfite and Fe (3 plus) allowed both growth and fluorescent pigment formation. Growth and fluorescent pigment formation were observed from a pH of 9.0 down to a pH of 7.5. At observed from a pH of 9.0 down to a pH of 7.5. At pH 7.5, the concentration of HSO3 (minus) is 0.0006 M, and this ion appears to be the active agent in inhibiting growth below pH 7.5. When the medium was adjusted to pH 7.0, neither fluorescent pigment formation nor growth was observed. The acid used for pH adjustment did not influence the minimum pH for growth. In the presence of small amounts of iron (ca. 1.0 microM Fe (3 plus)), the organism shifted from a blue to a yellow-green fluorescent pigment. Cultural conditions such as temperature and nutrients which supported growth also supported slime formation as well as fluorescent pigment formation. (Mortland-W73-13237

EFFECT OF DYES ON BACTERIAL GROWTH. Pennsylvania State Univ., University Park. Dept. of Microbiology.
For primary bibliographic entry see Field 05B.

For primar W73-13243

METABOLISM OF NITRILOTRIACETATE BY CELLS OF PSEUDOMONAS SPECIES,

Michigan State Univ., East Lansing, Dept. of Crop and Soil Sciences. For primary bibliographic entry see Field 05B. W73-13246

INTERACTING EFFECTS OF PH, TEMPERA-TURE, AND SALT CONCENTRATION ON GROWTH AND SURVIVAL OF VIBRIO PARAHAEMOLYTICUS, Georgia Univ., Experiment. Div. of Food Science. L. R. Beuchat.

Applied Microbiology, Vol 25, No 5, p 844-846, May 1973. 1 fig. 1 tab, 5 ref.

Descriptors: *Growth rates, *Hydrogen ion con-centration, *Temperature, *Sodium chloride, *En-vironmental effects, Heat resistance, Salt tolerance, Enteric bacteria, Pathogenic bacteria, Thermal pollution, Lethal limit, Water pollution effects, Marine bacteria, Anaerobic bacteria. Identifiers: "Survival, "Vibrio parahaemolyticus, Chemical concentration, Culture media, Recovery.

Thermal resistance and minimal pH and temperaconditions for growth of

parahaemolyticus in artificial media containing 3 and 7 percent sodium chloride were studied. Growth was observed at pH 4.8 and at 5C. To study thermal resistance a 0.3-ml portion of a 24-h culture was dispensed into tubes containing 19.7 ml of Trypticase soy broth (TSB) with 3 percent ml of Trypticase soy broth (TSB) with 3 percent NaCl which had been tempered at 53 plus or minus 0.2 C (128 F) in a water bath. Heating menstrua C (128 F) in a water bath. Heating menstrua been adjusted to pH values ranging from 5.0 to in 0.5-unit increments. Samples were addrawn, and dilutions were made immediately by using a 3 percent NaCl in water dilutent before by using a 5 percent water in water united to the plating in Trypticase-soy-agar (TSA) with 3 percent NaCl tempered at 45C. Recovery was at 37C, and counts were made after 24 h of incubation. Extensive growth at 5C was not observed at the pH values examined; no growth was observed at 2C.

Growth at 5 and 9C was only at an alkaline pH.

There was a tendency for growth at lower pH's as the incubation temperature was increased, re-gardless of NaCl concentration. With the exception of strain 4750, V. parahaemolyticus was demonstrated to grow at lower pH values in the TSB with 3 percent NaCl at pH 4.8 when incubation was at 30C, the lowest pH tolerance observed in the study. The six strains were least sensitive to heat at pH 7.0 and most sensitive at pH 5.0. (Mort-

SYNERGISTIC BIO-EFFECTS OF OIL AND IR-RADIATION IN AN AQUATIC ORGANISM, TARICHA GRANULOSA, Environmental Protection Agency, Rockville, Md. Office of Research and Monitoring. W. L. Lappenbusch, and J. M. Ward. Bulletin of Environmental Contamination and Toxicology, Vol 9, No 2, p 75-79, February 1973. 2 fig. 6 ref. fig, 6 ref.

Descriptors: *Oil, *Irradiation, *Water pollution effects, *Toxicity, *Radioactivity effects, Lethal limit, Animal pathology, X-rays, Bioassay, Laboratory tests, Mortality.

Identifiers: *Synergistic effects, *Rough-skinned newt, Histopathology, Necropsy, Animal tissues.

A study was conducted to determine lethal toxicity of oil and the possible synergistic effects of oil on the radiosensitivity of the rough-skinned newt (Taricha granulosa). After acclimitization at 10C to simulate winter conditions newts were initially placed in 4000 ml of water containing 0, 0.5, 1.0, 2.5, 5, 10, 20, or 50 percent by volume regular non-detergent motor oil. After determining oil toxicity levels, additional newts were classified in four groups prior to irradiation. One group was unexpected to either oil or irradiation. to either oil or irradiation, a second was irradiated only, a third was continuously exposed to 0.5 percent oil but not irradiated, and a forth con-0.5 percent on out not irradiated, and a forth continuously exposed to 0.5 percent oil and irradiated. The newts then absorbed 0, 1000, 2500, 5000, or 10,000 rads of x-rays. Their behavior, physical appearance and activity, and mortality were observed. Several dead newts of each group were necropsied and their tissues were examined. Oil toxicity was found to be acute, not chronic, at con-centrations of 2.5 percent and higher. Newts sub-jected to 1,000, 2,500, 5,000, and 10,000 rads has nean survival times of 141, 117, 85 and 54 days. For those subjected to 0.5 percent oil and radiation these survival time were lowered to 98, 75, 53, and 29 days. It was concluded that exposure to oil in creases the radiosensitivity of this newt synergisti-cally. (Mortland-Battelle) W73-13248

RESIDUES OF DDT IN COD FROM NORWEGI-

AN FJORDS, Norges Veterinarhoegskole, Oslo. Dept. of Phar-macology and Toxicology. For primary bibliographic entry see Field 05A. W73-13249

Group 5C-Effects of Pollution

TOXICITY OF METHYL MERCURY FOR STEELHEAD TROUT SPERM, Oregon Cooperative Fishery Unit, Corvallis. J. D. McIntyre.

Bulletin of Environmental Contamination and Toxicology, Vol 9, No 2, p 98-99, February 1973. 1

Descriptors: *Toxicity, *Mercury, *Rainbow trout, Viability, Water pollution effects, Reproduction, Bioassay, Cold-water fish,

trout, Viability, Water pollution effects, Reproduction, Bioassay, Cold-water fish, Cytological studies. Identifiers: "Sperm, "Methylmercury, "Steelhead trout, Salmo gairdneri, Methylmercuric chloride, Cell physiology.

Concentrations of methylmercuric chloride that would reduce the viability of sperm from the steel-head trout were determined. Sperm obtained from five fish was combined, and 0.1-ml aliquots were removed and inoculated into test tubes containing mercury concentrations of 1 g/l to 10 mg/l. The samples were maintained at 11C. The sperm was left in solution 30 minutes and then combined with 100 steelhead eggs from a single female. Percentage of fertilization was determined on the 17th day. Reduced fertilization of eggs indicated that concentrations of mercury greater than or equal to day. Reduced refulzation or eggs indicated that concentrations of mercury greater than or equal to 1 ppm reduced sperm viability. At concentrations greater than 1 ppm the reductions increased sharply. (Mortland-Battelle) W73-13250

CADMIUM TOXICITY AND ACCUMULATION

Oklahoma Univ. Health Sciences Center, Oklahoma City. Dept. of Environmental Health. J. E. Cearley, and R. L. Coleman.

Bulletin of Environmental Contamination and

Toxicology, Vol 9, No 2, p 100-101, February

Descriptors: "Cadmium, "Toxicity, "Bioassay, Water pollution effects, Absorption, Food chains, Path of pollutants, Salts, Spectrophotometry, Chlorophyll, Turgidity, Plant physiology, Heavy metals, Aquatic plants. Identifiers: "Southern naiad, "Bioaccumulation, "Najas guadalupensis, Stolons, Cadmium sulfate, Sample preparation, Ashing, Biological magnification, Mobilization, Macrophytes.

tion, Mobilization, Macrophytes.

The effects of three different levels of cadmium on the uptake and accumulation of this metal by the southern naiad, a waterweed, were investigated. A static bioassay was conducted over a 21-day period using duplicate exposure chambers for each exposure level. The plants were acclimated for 2 weeks and the roots removed before placement in the containers. Plants were exposed to different Cd levels for 0, 11, and 21 days. After exposure, the plant tissues were rinsed, dried for 24 hrs at 100C, and ashed for 24 hours. Metal determinations were made by spectrophotometry. The exposed plants showed reductions of chlorophyll, turgor and stolon development not seen in controls. Toxic reactions and Cd accumulation by the plants increased as the exposure levels increased, which suggested that (a) Cd accumulation, ca. 1000 fold, was a direct function of the exposure level, and (b) the detoxifying mechanism was over-taxed at a more rapid rate at the higher levels resulting in an earlier impairment of physiological function. It is evident that this common aquatic plant is capable of introducing potentially toxic quantities of cadmium into the food chain of higher organisms, e.g. sunfish and waterfowl. (Mortland-Battelle)

FATTY ACID COMPOSITIONS OF PARACOLONS: ARIZONA, CITROBACTER, AND PROVIDENCIA, Cornell Univ. Medical Coll., New York. Dept. of Microbiology.

Microbiology. N. A. Machtiger, and W. M. O'Leary.

Journal of Bacteriology, Vol 114, No 1, p 80-85, April 1973, 3 fig. 3 tab, 20 ref.

Descriptors: "Enteric bacteria, "Coliforms, Aerobic bacteria, Organic acids, Chemical analysis, Pollutant identification, Pathogenic bacteria. Identifiers: "Arizona arizonae, "Citrobacter freundii, "Providencia alcalifaciens, "Providencia stuartii, "Fatty acids, "Chemical composition, Flame ionization gas chromatography, Culture media, Sample preparation.

The fatty acid compositions of stationary-phase cultures of Arizona arizonae, Citrobacter freundii, Providencia alcalifaciens, Providencia stuartii, cultures of Arizona arizonae, Citrobacter freundii, Providencia alcalifaciens, Providencia stuartii, and Providencia sp. were studied. All organisms were grown in chemically defined media. Stationary-phase cells were harvested by centrifugation at 8200 times g for 20 min at 5 C, washed once in distilled water, and recentrifuged. The cell pastes were lyophilized, weighed and growth was measured turbidimetrically at 600 am. Total cellular fatty acids were extracted from dry cells, methylated, and analyzed by dual-column, dual flame ionization gas chromatography. The major fatty acids of A. arizonae, C. freundii, and Providencia were 16:0, 16:1, 17:cyclopropane, and 19:cyclopropane. The fatty acid compositions of the two strains of A. arizonae examined were similar to each other, but the three strains of C. freundii differed from one another in their fatty acid compositions. In both A. arizonae and C. freundii, the relative quantities of saturated, unsaturated, and cyclopropane fatty acids were similar to those which have been found in stationary-phase cultures of other members of the Enterobacteriaceae. The three strains of Providencia also differed from one another in their fatty acid compositions. In all three strains the total quantity of unsaturated fatty acids was larger and that of the cyclopropane fatty acids was smaller than those found in stationary-phase cultures of other enteric bacteria. (Holoman-Battelle)

SURVIVAL OF SALMONELLA TYPHIMURIUM IN ANIMAL MANURE DISPOSAL IN A MODEL

OXIDATION DITCH, Minnesota Univ., St. Paul. Coll. of Veterinary

L. A. Will, S. L. Diesch, and B. S. Pomeroy. American Journal of Public Health, Vol 63, No 4, p 322-326, April 1973. 1 fig, 2 tab, 21 ref.

Descriptors: *Pollutant identification, *Farm wastes, *Oxidation lagoons, *Model studies, *Waste disposal, Public health, Biochemistry, Dis-

*waste disposal, Public health, Biochemistry, Dissolved oxygen, Hydrogen ion concentration, Temperature, Cultures, Sampling, Pathogenic bacteria, Aerobic bacteria, Methodology. Identifiers: Survival, *Salmonella typhimurium, Fluorescent antibody techniques, Biochemical tests, Feces, Sample preservation, Culture media, Serology, Fecal coliforms, Leptospira pomona, Enrichment.

A laboratory model oxidation ditch was constructed to evaluate potential health effects of pathogens in cattle manure. The studies were conducted in a 1:10 scale model with pH, DO, temperature, and total solids regulated to simulate a field unit at summer (20C) and winter (2C) temperatures. Liquid manure obtained from a field ditch was placed in the laboratory ditch. Stock cultures of biologically and serologically pure Salmonella typhimurium were grown on tryptic soy agar and seeded into the ditch. Various cultural methods were used in measuring survival and differentiation was accomplished both biochemically and serologically. At summer temperatures S. typhimurium survived for 17 days post-seeding and at winter conditions for 47 days. The data indicated that survival was of greatest duration in dicated that survival was of greatest duration in the sludge portion of settling chambers. Attempts were made during the tests to use fluorescent an-tibody methods for measurement but these were not as successful as anticipated. Retrieval of

fluorescent organisms from the enrichment phase media was more successful than sampling directly from the oxidation ditch manure. (Mortland-Bat-W73-13253

METHANOL METABOLISM IN PSEU. METABOLISM IN PSEU-DOMONAD C, Hadassah Medical School, Jerusalem (Israel). B. Stieglitz, and R. I. Mateles. Journal of Bacteriology, Vol 114, No 1, p 390-398, April 1973. 8 fig, 5 tab, 19 ref.

Descriptors: "Metabolism, "Pseudomonas, *Radioactivity techniques, Nutrient requirements, Assay, Enzymes, Carbon radioisotopes, Aerobic bacteria, Oxidation, Electron microscopy, Colorimetry, Spectrophotometry, Bicarbonates, Absorptions Absorption: "Methanol, "Substrate utilization, "Fate of pollutants, Bacterial physiology, Pseu-domonads, Methanol dehydrogenase, Enzymatic activity, C-14, Assimilation, Hexose phosphate synthetase, Sample preparation, Paper chromatog-raphy, Culture media, Formaldehyde, Formates, Ethanol, Methylamine, Succinates, Citrates, Lac-tates, Serine, Glyoxylates, Pyruvates, Propanol, Butanol, Formate dehydrogenase, Formaldehyde dehydrogenase, Glycerate dehydrogenase. Absorption. Identifiers:

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Cell suspensions of pseudomonad C, a bacterium capable of growth on methanol as sole carbon source, were able to oxidize methanol, formal-dehyde, and formate, although the rates of oxidation for the latter two compounds were much slower. The latter compounds also could not serve as sole carbon sources. Through the use of labeled compounds, it was shown that in the presence of methanol, formaldehyde, formate, and bicarbonate were incorporated into trichloroacetic acid-precipitable material. Hexose phosphate synthetase activity was found, indicating the assimilation of methanol via an allulose pathway. No hydroxypyruvate reductase activity was found, hydroxypyruvate reductase activity was found, nor was any complex membrane structure ob-served. Such a combination of characteristics has been observed in an obligate methylotroph (P-suedomonas W1), but pseudomonad C can utilize a variety of non-methyl substrates. (Holoman-Bat-W73-13256

METABOLISM OF ENDOTHALL BY AQUATIC MICROORGANISMS,

MICROORGANISMS, Syracuse Univ. Research Corp., N.Y. Life Sciences Div. H. C. Sikka, and J. Saxena. Journal of Agricultural and Food Chemistry, Vol 21, No 3, p 402-406, May/June 1973. 5 fig, 3 tab, 16

Descriptors: *Aquatic microorganisms, *Metabolism, *Microbial degradation, *Aquatic environment, *Cultures, Lakes, Hydrosols (Soila), Aquatic bacteria, Bottom sediments, Herbicides, Radioactivity techniques, Amino acids, Proteins, Lipids, Inhibition, Path of pollutants, Chromatog-

Lipids, innibuon, ratio of pollutants, *Endothall, *Arthrobacter, *Substrate utilization, Biological magnification, Assimilation, Degradation products, 7-Oxabicyclo (2.2.1)heptane-2 3-dicarboxylic acid, Mobilization, Nucleic acids, Citricacid, Glutamic acid, Aspartic acid, Alanine, Monofluoroacetate, Sample preparation.

(C-14)Endothall (7-oxabicyclo (2.2.1)heptane-2,3-dicarboxylic acid) labeled in the oxabicyclo ring dicarboxylic acid) labeled in the oxabicyclo ring was readily degraded by microorganisms in lake water and hydrosoil through a pathway involving splitting of the ring. An Arthrobacter species isolated from hydrosoil by the enrichment method was able to utilize endothall as the sole source of carbon and energy for its growth. The C-14 from endothall was incorporated into cellular amino

Effects of Pollution-Group 5C

acids, proteins, nucleic acids, and lipids and was also released as C-1402. After short-term incubaauso reseased as C-1402. Atter short-term incuba-tion of the Arthrobacter with (C-14)endothall, C-14 was incorporated into citric, aspartic, and glu-tamic acids and some unidentified compounds. (C-14)Glutamic acid accounted for a large proportion of the total C-14 incorporated into the alcohol-soluble cell fraction. Treatment with 0.02 M propoflurogetate caused a sease-1644 source cell fraction. Treatment with 0.02 M monofluoroacetate caused a severalfold accumulation of (C-14) citric acid, but only partially inhibited the incorporation of C-14 into glutamic acid. It appears, therefore, that the C-14 from C-14-ring-labeled endothall is incorporated into glutamic acid via the tricarboxylic acid cycle and an alternate, unknown pathway. (Holoman-Battelle) W73-13258

THE DETERMINATION OF ALL DETECTABLE ELEMENTS IN THE AQUATIC PLANTS OF LINSLEY POND AND CEDAR LAKE (NORTH BRADFORD, CONNECTICUT) BY X-RAY EMISSION AND OPTICAL EMISSION SPEC-

Pittsburgh Univ., Pa. Dept. of Biology. For primary bibliographic entry see Field 05A. W73-13261

UPTAKE AND ACCUMULATION OF DDT AND PCB BY EPHEMERA DANICA (EPHEMEROF TERA) IN CONTINUOUS-FLOW SYSTEMS.

Lund Univ. (Sweden). Dept. of Zoology.

A. Sodergren, and Bj. Svensson.
Bulletin of Environmental Contamination and Toxicology, Vol 9, No 6, p 345-350, June 1973. 1 fig, 2 tab, 13 ref.

Descriptors: *DDT, *Polychlorinated biphenyls, *Absorption. *Mayflies, *Pesticide kinetics, Descriptors: "DDT, "Polychlorinated biphenyls, 'Absorption, "Mayflies, "Pesticide kinetics, Laboratory tests, Pesticide residues, Mathematical models, Gas chromatography, Chlorinated hydrocarbon pesticides, Aquatic insects, Imma-ture growth stage, Bioassay, Water pollution effects

Identifiers: *Ephemera danica, *Bioaccumulation, Continuous flow system, Nymphs, p p'DDT, Metabolites, p p'DDE, p p'DDD.

The kinetics of uptake and accumulation of DDT and PCB by mayflies was examined in a continuous-flow systems. Fifty Ephemera danica nymphs were used as test organisms and were introduced to the continuous-flow system immediately after collection from a Swedish stream. DDT and PCB were dissolved in ethanol and added to the systems. Five nymphs were then withdrawn each day for residue analysis. During the nine days of the experiment the animals received no food so that uptake was strictly via the gills and integument. Gas chromatography was used for residue analysis. Uptake and accumulation of both substances followed a similar pattern. After 4-5 days exposure an apparent constant level was established, indicating equilibrium between uptake and excretion of the substances. The accumulation of residues as a function of the concentration in the water showed a similar pattern. A kinetic equation of the first order is proposed as a model for uptake. (Mortland-Battelle) The kinetics of uptake and accumulation of DDT

A METHOD FOR RTING CHEMICALS FOR POTENCY AGAINST FISH AND OTHER OR-

POTENCY AGAINST FISH AND GRANISMS, Sureau of Sort Fisheries and Wildlife, La Crosse, Wis. Fish Control Lab.
L. Marking.
US Bur Sport Fish Wildl Invest Fish Control. 36-38. 3-8. 1970. Illus.
Identifiers: Chemicals, "Fish, Methods, Organisms, "Toxicity ratings, Lethal limit, Water pollution effects.

A potency rating system by which the toxicity of chemicals to organisms can be assessed with a

minimum of data from preliminary bioassays was presented. This method permitted effective and rapid evaluation of toxicity when data from preliminary tests were inadequate for statistical analysis. In bioassays of chemicals against fish, the mortality was recorded in 3-96-hr tests when exposed to 3 concentrations. The potency rating of a bioassayed chemical, when compared with the maximum value on the rating scale, indicated the relative toxicity of the chemical. Concentrations and exposure times could be changed to fit a specific bioassay program. Results of 24-or 48-hr bioassays could be compared with 96-hr bioassays because the maximum values of the rating scales were approximately equal at all time intervals. The were approximately equal at all time intervals. The potency rating was more applicable to toxicants with similar dose-effect curves.—Copyright 1973, Biological Abstract, Inc. W73-13269

PERSISTENCE OF VIRUS AND BACTERIA IN SEAWATER, California Univ., Berkeley, School of Public

Health.

W. D. Won, and H. Ross.

Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol 99,

No EE3, p 205-211, June 1973. 6 fig. 1 tab, 9 ref.

Descriptors: "Sea water, "Persistence, "E. coli, "Environmental effects, "Enteric bacteria, "Viruses, Coliforms, Water temperature, Water pollution, Domestic wastes, Public health, Organic wastes, Organic compounds. Identifiers: Survival, Echo 6 virus, Culture media,

Enrichment, Enterovirus, Cell over Problems, Fecal pollution, Feces, Yeast extract, Trypticase soy broth, Casamino acid, Peptone, Heart infusion broth, Castione.

At a temperature of 38 F-40 F bacterial survivals (Escherichia coli) were significantly enhanced in seawater deliberately 'polluted' with small concentrations of organic materials (25 ppm-500 ppm) including peptone, heart infusion, casamino acid, yeast extract, trypticase soy, and human feces. In yeast extract, trypticase soy, and human feces. In a warmer environmental temperature the survival enhancing property of these substances became growth promoting resulting in a 40-fold population increase followed with a marked increase in microbial persistence lasting at least 18 weeks. These substances were also capable of stabilizing cell and colony morphology. The same phenomenon was not observed in parallel experients with Echo 6 virus. In this instance, cold phenomenon was not observed in parallel experiments with Echo 6 virus. In this instance, cold temperature per se appeared more effective in enhancing survival time. Inactivation rate was gradual and the virus persisted for 14 weeks at 38 F-40 F, contrasted sharply with an 8-day persistence at an environmental temperature of 72 F. (Holoman-Battelle) W73-13272

ECOLOGY OF TWO RELATED SPECIES OF CADDIS FLY LARVAE IN THE ORGANIC SUB-STRATES OF A WOODLAND STREAM, McGill Univ., Montreal (Quebec). Dept. of Biolo-

For primary bibliographic entry see Field 05B. W73-13286

MERCURY CONTAMINATION OF FISH IN NORTHWESTERN ONTARIO, Acres (H. G.) and Co. Ltd., Niagara Falls (On-

N. Fimreite, and L. M. Reynolds. Journal of Wildlife Management, Vol 37, No 1, p 62-68, January 1973. 2 fig. 4 tab, 17 ref.

Descriptors: "Mercury, "Freshwater fish, Water pollution effects, "Industrial wastes, Water pollu-tion sources, Rock bass, Walleye, Lake trout, Water pollution, Path of pollutants, Lakes, Rivers, Absorption, "Canada.

Identifiers: *Chlorine plants, *Atomic absorption spectrophotometry, Northern pike, White sucker, Burbot, Biological samples, Sample preparation, Acid digestion, Clay Lake, Wabigoon River, Ball Lake, Tide Lake, Indian Lake, Grassey Narrows Lake, Tetu Lake, Big Canyon Lake, Long Legged Lake, Sumach Lake, Oak Lake, Maynard Lake, Scotty Lake, Dumpy Lake, Lennan Lake, Rowdy Lake, Sydney Lake, Roger Lake.

Fish to be analyzed for mercury were gill-netted from 18 lakes and rivers in Northern Ontario, some of which were upstream and downstream from a chlorine plant which had leaked about 3,000 lbs of mercury annually from 1962-1970. Samples consisted of 186 specimens of walleye, northern pike, lake trout, burbot, rock bass, and white sucker. Mercury content was determined in lateral musculature by wet digestion of the samples followed by cold vapor atomic absorption spectrophotometry. The maximum mercury levels in orthern pike, burbot, and walleye were 27.8, 24.8, and 19.6 ppm respectively, measured in specimens taken 50-60 miles downstream from the plant. They decreased proportionally to the distance from the plant but were clearly elevated even 200 miles downstream. The levels in specimens from mues downstream. The levels in specimens from suspected uncontaminated lakes were generally below 1 ppm but frequently above the 0.2 ppm often considered as the maximum background concentrations. The latter finding may possibly be explained on the basis of the oligotrophic conditions characteristic for these lakes. (Little-Bat-telle) W73-13287

COMPARATIVE TOXICITY OF 29 NITROSAL-ICYLANILIDES AND RELATED COMPOUNDS TO EIGHT SPECIES OF FISH,

Bureau of Sport Fisheries and Wildlife, La Crosse, Wis. Fish Control Lab. L. L. Marking, and W. A. Willford. US Bur Sport Fish Wildl Invest Fish Control. 36-

38. 3-11. 1970. Identifiers: Black bullheads, Bluegill, Carp, Fathead minnows, "Fish, Goldfish, Green sunfish, Minnow, "Nitro salicylanilides, Rainbow trout, Organic compounds, Species, "Toxicity, Yellow

The relative potencies of 29 nitrosalicylanilides and related structures against rainbow trout, gold-fish, carp, fathead minnows, black bullheads, green bullheads, green sunfish, bluegills and yellow perch were determined in 96-hr static bioassays and varied from zero to the maximum poten-cy of the system, depending on the type and posi-tion of substitutions. The 4'-substitutions on 3-nitrosalicylanilide were essential in producing high toxicity and selectivity to fish. The toxic activity of nitrosalicylanilides increased as halogen substitutions were shifted from the 2' to the 3' and to the 4' positions on the aniline moiety. Activity increased as molecular weight of the substituent increased 4'-Azophenyl-3-nitrosalicylanilide and 4'-iodo-3-nitrosalicylanilide were more toxic than 4'-bromo- or 4'-chloro-3-nitrosalicylanilides were more toxic than monohalo-substituted 3-nitrosalicylanilides were more toxic than monohalo-substituted 3-nitrosalicylanilides provided one of the halosubstitutions was at the 4'-position on the aniline moiety. 4'-Bromo-3-nitrosalicylanilides. toxicity and selectivity to fish. The toxic activity nitrosalicylanilide was more toxic to carp, fathead minnows, bluegills and yellow perch than to rain-bow trout. Several compounds were selective to yellow perch. Goldfish were the most resistant species to the salicylanilides.—Copyright 1973, Biological Abstracts, Inc. W73-13288

ECOLOGICAL EFFECTS OF OFFSHORE DREDGING AND BEACH NOURISHMENT: A

REVIEW, University of Southern Mississippi, Hattiesburg.

Group 5C-Effects of Pollution

Available from the National Technical Informa-tion Service as AD-756 366, \$3.00 in paper copy, \$1.45 microfiche. Miscellaneous Paper No 1-73, January 1973. 39 p., 196 ref.

Descriptors: *Dredging, *Sediments, Ecosystems, *Environmental effects, *Coastal engineering, Bibliographies, Reviews, Benthic flora, Bottom fish, Biota, Turbidity, Suspended solids, Benthic fauna, Zoning, Abstracts, Documentation, Bottom ments, Data collections, Marine bacteria, Physical properties, Chemical properties, Ecology, Coasts, Marine algae, Marine fish.

Identifiers: *Beach nourishment, Marine environ-

A review of ecological effects of offshore dredging is presented, based on literature review and personal contacts, to provide a framework for determination of need for further knowledge. In general, little concrete effort aimed specifically at the determination of effects of offshore dredging the determination of effects of offshore dredging was uncovered, although basic ecological works that are generally applicable are available. Much additional research of basic, but practical, orientation is needed to approach full understanding. The beach may be divided into three zones on the basis of moisture and biota found. The possible effects on these biota resulting from offshore dredging and deposition of sediments on a beach are described. Background descriptive material and impacts on both offshore dredged areas and nourished beaches, and suggestions for further research follow. (Mortland-Battelle) W73-13290

EFFECT OF THERMAL SHOCK ON VULNERA-BILITY TO PREDATION IN JUVENILE SAL-MONIDS, II. A DOSE RESPONSE BY RAINBOW TROUT TO THREE SHOCK TEMPERATURES, Battelle Memorial Inst., Richland, Wash. Pacific Northwest Labs.

Available from the National Technical Informa-tion Service as BNWL-1519, \$3.00 in paper copy, \$1.45 microfiche. Report No UC-48, November 1972. 12 p., 2 fig, 1 tab, 7 ref. Contract No AEC AT (45-1)-1830.

Descriptors: *Thermal pollution, *Predation, *Thermal stress, *Chinook salmon, *Rainbow trout, *Laboratory tests, Water temperature, Lethal limit, Juvenile fish, Bioassay, Water pollu-tion effects, Time, Heat resistance. Identifiers: *Thermal shock, Salmo gairdneri, Oncorhynchus tshawytshcha.

Juvenile rainbow trout (Salmo gairdneri) were found to be more vulnerable to predation follow-ing thermal shock, dependent on the thermal dose (temperature and duration) received. The fish were exposed to temperatures of 26, 28, and 30C for periods from 0.5 to 100 minutes. Control fish were exposed to unheated water. Control and shocked fish were then reunited at the acclimation temperature and offered to adult rainbow trout lators. The predators were allowed a maxi of 15 minutes to remove about 50 percent of the prey and the remaining test and control fish were counted. A chi-square analysis was used on the results. At 30C exposure, an identifiable effect in vulnerability of the shocked fish occurred after only 0.55 min exposure. At 28C, an exposure of about 2 min was needed to increase vulnerability. The 26C exposure temperature, included significantly different predation rates after 64 min but not after 16 or 32 min. (Mortland-Battelle)

NITROGEN METABOLISM IN THE SEA. Lamont Geological Observatory, Palisades, N.Y. For primary bibliographic entry see Field 05B. TOXICITY OF 33NCS (3'-CHLORO-3-NITRO-SALICYLANILIDE) TO FRESHWATER FISH

AND SEA LAMPREY, Bureau of Sport Fisheries and Wildlife, La Crosse, Wis. Fish Control Lab. L. L. Marking, E. L. King, C. R. Walker, and J. H.

US Bur Sport Fish Wildl Invest Fish Control. 36-38. 3-16. 1970.

Identifiers: Bowfin, Carp, Catfish, Channel, Chlor-3-Nitro, Fish, *Fresh water fish, *Sal-icylanilides, *Sea lamprey, Sunfish, *Toxicity, Trout, Water pollution effects.

The chemical 33NCS (3'-chloro-3-nitrosalicylanilide) was evaluated as a fish control agent and as a
larvicide for sea lampreys. The chemical was
rapidly toxic to many species. Sea lampreys, bowfin and channel catifish were the most sensitive
species. Carp were more sensitive than trouts or
sunfishes. Use of 33NCS in selective control of
reshwater fishes or sea lampreys required precise
control because its toxicity was strongly influenced by variations in water quality.—Copyright
1973, Biological Abstracts, Inc.
W73-13293

A REPORT ON BACTERIAL POLLUTION AF-FECTING SHELLFISH HARVESTING IN NEW-PORT RIVER, NORTH CAROLINA. Environmental Protection Agency, Athens, Ga. Surveillance and Analysis Div. For primary bibliographic entry see Field 05B. W73-13298

ACCUMULATION AND RETENTION OF 85SR MARKS BY YOUNG LARGEMOUTH BASS, Cornell Univ., Ithaca, N.Y. Dept. of Natural

M. H. Shealy, Jr., and C. A. Carlson. 1971. 42 P. OWRR A-013-NY (7). 14-01-0001-927, 1400, 1852, 14-31-0001-3032.

Descriptors: *Bass, *Marking techniques, Radioecology, *Mortality, *Radioactivity effects, Growth stages, Strontum radioisotopes. Identifiers: *Fish embryos.

First-year mortality in largemouth bass, Microp-terus salmoides (Lacepede), is often higher than 90%. To better understand the role of predation by aquatic invertebrates in this high death rate, young bass were marked at four different ages with 85Sr for subsequent use in predation studies. Resulting radiostrontium accumulation and retention curves indicate that this radionuclide is suitable for quan-itative mercing of prolary and prolary. indicate that this radionuclide is suitable for quantitative marking of prolarval, postlarval, and juvenile bass, but not embryos. Bass embryos were exposed to one, and prolarval and older stages to three, 85's concentrations at 20 to 23°C. Exposure energies ranged from 0.0 (controls) to 89.1 microCi/liter pond water. Twelve-hr radioaccumulation and retention rates were obtained for embrace (2) days old). Bediesconsymbiation aware motivated to the stage of lation and retention rates were obtained for emb-ryos (2 days old). Radioaccumulations were moni-tored in prolarvae (<1 day old) at 12-hr intervals from 12 to 168 hr, in postlarvae (15 days old) at 24-hr intervals from 24 to 144 hr, and in juveniles (40 days old) at 24-hr intervals from 24 to 120 hr. Bass from all accumulation experiments were trans-ferred, after various periods of exposure, to pond water to which no 85Sr was added, and mark re-tentions were evaluated for periods of up to 106 days. days. W73-13304

FRESHWATER ECOLOGY. Battelle-Pacific Northwest Labs., Richland, Wash. Ecosystems Dept. For primary bibliographic entry see Field 05B. W73-13341

MARINE SCIENCES.
Battelle-Pacific Northwest Labs., Richland,
Wash. Ecosystems Dept.

For primary bibliographic entry see Field 05B. W73-13343

FATE AND EFFECTS OF RADIONUCLIDES IN

ALASKA.

Battelle-Pacific Northwest Labs., Richland,
Wash. Radiological Sciences Dept.
For primary bibliographic entry see Field 05B.
W73-13348

THE ANOPHELES GAMBIAE COMPLEX AND MALARIA TRANSMISSION AROUND KISUMU,

East African Inst. of Malaria and Vector-borne Diseases, Amani (Tanzania).
G. B. White. Identifiers: *Anopheles-Gambiae, Fenitrothion, Insecticides, *Kenya (Kisumu), *Malaria trans-

The environment surrounding Kisumu in Kenya, East Africa, is described, emphasizing the im-portance of the Nyando valley as a highly malari-East Africa, is described, emphasizing the importance of the Nyando valley as a highly malarisous area compared with the Nandi and Kisii hills where only epidemic malaria occurs. Available data on malaria transmission are summarized. The varying seasonal importance of A. gambiae as a vector in the different topographical areas is discussed. Data resulting from a brief survey of the A. gambiae complex (Nov. 10-Dec 3, 1970) conducted during very hot and dry weather are presented to show that Species A and Species B resting in houses are differentially distributed in this part of Nyanza. Species B predominated in the lowlands and was prolific in the artificially irrigated areas. Species A predominated in the highlands. Both sibling species were well represented in sympatric association among foothills. Only 3 females of A. gambiae (1A and 2B) were obtained from the experimental area of 23 square miles employed by the World Health Organization (WHO) for hut testing of fenitrothion for anopheline control. Circumstances indicated that both Species A and Species B formerly occurred more abundantly in this zone. Although Species A was restricted virtually to the highlands and foothills at this season, populations of A probably would encroach into the lowlands during raining periods. WHO data on parous rates of A. gambiae at 2 localities near Kisumu are presented to show that Species B my continue reproducing at a greater rate than Species A she dry season gamoiae at 2 localities near Kisumu are presented to show that Species B may continue reproducing at a greater rate than Species A as the dry season progresses.—Copyright 1973, Biological Abstracts, Inc. W73-13386

NITROGEN-FIXING BLUE-GREEN ALGAE OF SOILS, RICE FIELDS AND EPHEMERAL BASINS OF THE SOUTHERN UKRAINE, (IN

RUSSIAN), L. P. Prykhod'kova. Ukr Bot Zh. Vol 28, No 6, p 753-758. 1971. English

Identifiers: *Algae (Nitrogen-fixing), Anabaena-variabilis, Cylindrospermum-Michailovskoense, Nitrogen, Nostoc-Commune, Nostoc-Linckia, Rice fields, *Soils, *Ukraine (USSR),

Of the 23 spp. found, 12 spp. were from soils (southern chernozems, dark-brown, chestnut, solonetz, gley-solods, solonehaks, meadow, bog and sands), 16 from the ephemeral basins and 18 from the rice fields. Many species were seen rarely in small amounts. Notice commune (Vauch) in in small amounts. Nostoc commune (Vauch.) in sensu Elenk., N. linckia (Roth.) Born. et Flah. in sensu Elenk., Cylindrospermum michailovskoense Elenk., Anabaena variabilis Kuetz. and others Elenk. Anabaena variabilis Kuetz. and others were sometimes dominant in the soils and basins. The blue-green algae developed more abundantly in the rice fields. The amount of N-fixing species at the beginning of rice vegetation is negligible and increases in Aug. and Sept. In the subsaline basins blue-green algae N-fixers were more frequent and more diverse.—Copyright 1973, Biological Abstracts less. stracts. Inc.

W73-13391

EXPERIMENTAL STUDY OF THE EFFECT OF TEMPERATURE ON SOME PIKE PARASITES, tUSSIAN), ngrad State Univ. (USSR).

Leningrad State Univ. (USSA).

B. I. Kuperman, and R. E. Shul'man.
Vesta Leningr Univ. Ser Bio. Vol 27, No 1, p 5-15.
1972. English summary.
Identifiers: Ergasilus-Sieboldi, *Parasites, *Pike,
*Temperature effects, Triaenophorus-Crassus,
Triaenophorus-Nodulosus.

The effect of temperature on the lifecycle of Triaenophorus nodulosus, T. crassus and Ergasilus sieboldi was investigated. The change of temperatures from winter and autumn to spring and summer had different effects on the parasites. The temperature affects the parasites indirectly, as it changes the physiological state of the host, and this in turn affects the parasites.—Copyright 1973, Biological Abstracts, Inc. W73-13399

SURVEY OF ENVIRONMENTAL RADIOAC-TIVITY, JANUARY 1-DECEMBER 31, 1972, Ames Lab., Iowa. For primary bibliographic entry see Field 05B. W73-13402

MODEL OF THE ACCUMULATION OF FOSSIL CO2 IN THE ATMOSPHERE AND THE SEA, Washington Univ., Seattle. Dept. of Chemistry. For primary bibliographic entry see Field 05B.

USE OF HANFORD WASTE PONDS BY WATERFOWL AND OTHER BIRDS, Battelle-Pacific Northwest Labs., Richland, Wash

R. E. Fitzner, and K. R. Price. Available from NTIS, Springfield, Va., as BNWL-1738; \$4.00 in paper copy, \$1.45 in microfiche. Re-port BNWL-1738, February 1973. 47 p, 7 fig, 4 tab, 19 ref.

Descriptors: "Washington, "Waterfowl, "Absorp-tion, "Nuclear wastes, Census, Mallard duck, Ringnecked duck, Migratory birds, Game birds, Radioisotopes, Absorption, Food webs, Public health, Food chains, Radioactivity effects, Path of pollutants, Aquatic habitats, Ponds, Cooling

water.

Irrigation and hydroelectric development in the Columbia Basin have increased waterfowl. Four waste ponds in an area of the Hanford Reservation are being observed that range from 17-71 acres in acrea, 2-10 feet in depth, and have radioactivity less than 50 picoCuries/ml. Sampling has shown that there is insufficient radioactivity in the birds to be hazardous to human consumption. A census of birds over a year (16 species of waterfowl and 90 species of other birds) indicated that remote, large-area, and deep ponds were most attractive. Eighty-five percent of the species were migrants; Mallard ducks and Ring-necked ducks were the most abundant species and were present for long times. It is planned to study radionuclide uptake by a colony of young birds in the spring, and of populations simulating wintering waterfowl. Information about the general life history of the species observed is reviewed. (Bopp-ORNL)

AMCHITKA BIOENVIRONMENTAL PROGRAM. RESEARCH PROGRAM ON MARINE ECOLOGY, AMCHITKA ISLAND, ALASKA, JULY 1, 1911-JUNE 30, 1972, Washington Univ., Seattle. R. E. Nakatani, J. S. Isakson, and R. L. Burgner. Available from NTIS, Springfield, Va., as BMI-171-150; \$5.45 in paper copy, \$1.45 in microfiche.

Report BMI-171-150, April 1973. 73 p, 11 fig, 9 tab, 22 ref, 3 append.

Descriptors: *Marine algae, *Marine fisheries, *Nuclear explosions, *Alaska, Marine animals, In-tertidal areas, Aquatic habitats, Autogeaic succes-sion, Sampling, Monitoring, Invertebrates, Fish populations, Fishkill, Environmental effects.

Effects on marine fish, invertebrates, and alg were studied including radiological sampling. The Cannikin nuclear test caused permanent uplift of intertidal benches about 6.1 km alongshore, disrupting algae and invertebrates; but recovery of fish populations is expected since only a small habitat area was disrupted. In the smaller area of disruption from the Milrow test, Hedophyllum alga replaced Fucus, leading to growth comparable to that on nearby undisturbed rocks; compared with 1971 observations, an area of siltation on the intertidal bench was reduced in size. (Bopp-W73-13405

FRESHWATER VERTEBRATE AND INVER-TEBRATE ECOLOGY OF AMCHITKA ISLAND. JULY 1, 1971-JUNE 30, 1972, Utah State Univ., Logan. W. T. Helm, and R. A. Valdez.

171-148; \$4.00 in paper copy, \$1.45 in microfiche. Report BMI-171-148, April 1973. 17 p, 3 fig, 4 tab, 4 ref. Available from NTIS, Springfield, Va., as BMI-

Descriptors: *Water pollution effects, *Alaska, *Nuclear explosions, *Aquatic habitats, Fishkill, Fish populations, Environmental effects, Lakes, Streams, Silting, Oil pollution, Smolt, Salmon.

The Cannikin test drained 5 freshwater lakes (by fissures and tilting) that are not expected to refill and support fish. Drilling mud spillage from a retention pond severely depleted aquatic life in one small stream. Another stream similarly polluted e Milrow test showed recovery from pol lution. Pollution of streams (about 5% of the total) and lakes (about 0.2%) by drainage of oil and silt may have longer-lasting effects. Smolting of coho salmon was studied. (Bopp-ORNL) W73-13406

METHODOLOGY FOR THE IDENTIFICATION OF A BIOLOGICAL INDICATOR IN RADIOECOLOGY: EXAMPLE OF CS137 AND A FRESHWATER MOLLUSC ANODONTA, (METHODOLOGIE POUR LA RECHERCHE D'UN INDICATEUR BIOLOGIQUE RADIOECOLOGIE), For primary bibliographic entry see Field 05A. W73-13407

FINAL ENVIRONMENTAL STATEMENT RE-LATED TO OPERATION OF SURRY POWER STATION UNIT 1.
Directorate of Licensing (AEC), Washington, D.C.

Available from NTIS, Springfield, Va., as Docket 50280-75. \$7.60 per copy, \$1.45 microfiche. Docket 50280-75, May 1972. 286 p, 39 fig, 32 tab, 175 ref,

Descriptors: *Nuclear powerplants, *Effluents, Environment, Administrative agencies, *Comprehensive planning, *Sites, Geology, Investigations, Hydrology, Seismology, Meteorology, Ecology, Radioactive wastes, Water pollution, Water pollution sources, Radioactive effects, Monitoring, Public health, Transportation, Beneficial use, Cost-benefit analysis, *Virginia. Identifiers: *Pressurized water reactors, James Piters *Bayingparestatements River, *Environmental impact statements.

This final environmental statement relates to the proposed issuance of an operating license for the Surry Power Station Unit 1. The plant is located in Surry County, Virginia, and will employ two presurized water reactors which will be covered by water from and returned to the James River. Environmental impacts are assessed, and, after consideration of alternatives, an environmental benefit-cost summary was compiled. Some environmental factors considered include hydrology (surface water and groundwater), ecology including aquatic life, cooling-water supply and discharge, cooling towers, cooling lakes, spray ponds, radioactive chemical and sanitary wastes, amount of dissolved oxygen and toxic chemicals in effluent water. The conclusion was to issue an operating license for Unit 1 subject to the following conditions: (1) establish a monitoring program, ing conditions: (1) establish a monitoring program, both radiological and nonradiological to determine the impact of the plant on the environment, (2) monitor the number and species of fish kills attributed to operation of the station. (Houser-ORNI)

AQUATIC, BIOENVIRONMENTAL STUDIES IN THE COLUMBIA RIVER AT HANFORD 1945-1971. A BIBLIOGRAPHY WITH ABSTRACTS, Battelle-Pacific Northwest Labs., Richland, For primary bibliographic entry see Field 05B. W73-13409

FINAL ENVIRONMENTAL STATEMENT RE-LATED TO THE ST. LUCIE PLANT UNIT NO. Directorate of Licensing (AEC), Washington,

Available from NTIS, Springfield, Va., as Docket 50335-63; \$7.60 per copy, \$1.45 microfiche. Docket 50335-63, June 1973. 284 p, 21 fig, 31 tab, 115 ref, 2

Descriptors: "Nuclear powerplants, "Effluents, Environment, Administrative agencies, "Comprehensive planning, "Sites, Geology, Investigations, Hydrology, Seismology, Meteorology, Ecology, Radioactive wastes, Water pollution, Water pollution sources, Radioactive effects, Monitoring, Public health, Transportation, Beneficial use, Cost-benefit analysis, "Florida, Atlantic Ocean, Iodine. Ocean, Iodine,

Identifiers: *Pressurized water reactors, Indian River, Big Mud Creek, *Environmental impact

This final environmental statement relates to the proposed continuation of construction and issuance of an operating license for the St. Lucie Plant Unit No. 1. The plant is located on Hutchinson Island on the East Coast of Florida, midway, between the cities of Fort Pierce and Stewart. It will use a pressurized-water reactor cooled by a once-through system with water from and discharged to the Atlantic Ocean. Environmental impacts are assessed and after consideration of alternatives an environmental benefit-cost summary impacts are assessed and after consideration of al-ternatives an environmental benefit-cost summary was compiled. Environmental factors considered include hydrology (surface water and ground water), ecology including aquatic life, cooling-water supply and discharge, cooling lakes, spray ponds, radioactive chemical and sanitary wastes, amount of dissolved oxygen and toxic chemicals in effluent water. The conclusion is to continue the construction permit and issue an operating license subject to the following condi-tions: (1) Minimize beach construction activities during turtle nesting season. (2) Restore disturbed dune area. (3) Maintain 1-131 release as low as practicable. (4) Plant pines for light screens. (5) Perform an aquatic monitoring program. (6) Deter-mine the effect of the thermal plume on turtle nest-ing. (7) Conduct a radiological monitoring pro-gram. (8) Ensure that the thyroid dose though food

Group 5C-Effects of Pollution

chain (grass-cow-milk) does not exceed 5 mrem/yr. (9) Monitor residual chlorine concentration. (10) Define a comprehensive environmental monitoring program and include in specifications. (11) Provide an analysis and plan of action against any detrimental effects found. (Houser-ORNL) W73-13410

FINAL ENVIRONMENTAL STATEMENT RE-LATED TO THE CONTINUATION OF CON-STRUCTION OF UNIT 2 AND THE OPERA-TION OF UNITS 1 AND 2 MILLSTONE NUCLEAR POWER STATION. Directorate of Licensing (AEC), Washington,

Available from NTIS, Springfield, Va., as Docket No. 50336-65, \$7.60 per copy, \$1.45 microfiche. Report No. Docket 50336-65, June 1973. 315 p, 24 fig, 47 tab, 138 ref, 2 append.

Descriptors: "Nuclear powerplants, Effluents, Environment, Administrative agencies, "Comprehensive planning, "Sites, Geology, Investigations, Hydrology, Seismology, Climatology, Meteorology, Ecology, Radioactive wastes, Water pollution, Water pollution sources, Radioactive effects, Monitoring, Public health, Transportation, Beneficial use, Cost-benefit analysis, Water cooling, Connecticut, "New York."

ing, Connecticut, *New York.

Identifiers: *Boiling water reactor, *Pressurized water reactors, Niantic Bay, Long Island Sound, *Environmental impact statements.

This final environmental statement was prepared in compliance with the National Environmental Policy Act and relates to the proposed continua-tion of construction permit for Unit 2 and opera-tion licenses for Units 1 and 2 Millstone Nuclear tion licenses for Units 1 and 2 Millstone Nuclear Power Station. This station is located in the town of Waterford, Connecticut. Cooling is by a once-through flow of water from Niantic Bay which is discharged through a quarry pond and back into Long Island Sound. Unit No. 1 is a boiling water reactor and Unit No. 2 a pressurized water reactor. Environmental impacts are assessed and after consideration of alternatives an environmental benefit-cost summary was compiled. Environmental factors considered include climate, hydrology (surface water and ground water), ecology including aquatic life, cooling-water supply and discharge, cooling towers, cooling lakes, spray ponds, radioactive chemical and sanitary wastes, amount of dissolved oxygen and toxic chemicals in ponds, radioactive chemical and sanitary wastes, amount of dissolved oxygen and toxic chemicals in effluent water. The conclusion is to continue the construction permit for Unit 2 and issue operating licenses for Units 1 and 2 subject to the following conditions: (1) applicant shall define acceptable comprehensive environmental sampling monitoring, and surveillance programs as a part of technical specifications for Units 1 and 2; (2) a further truth of the discharge of water from the quarry to cal specifications for Units 1 and 2; (2) a further study of the discharge of water from the quarry to Long Island Sound to minimize entry of aquatic organism into the quarry; (3) continue study to les-sen impingement of aquatic bodies on the cooling water intake screens; (4) provide analysis and propose a course of action to alleviate problems found by the monitoring programs. (Houser-OBNI) W73-13411

FINAL ENVIRONMENTAL STATEMENT RE-LATED TO THE CONSTRUCTION OF SUSQUEHANNA STEAM ELECTRIC STATION UNITS 1 AND 2.
Directorate of Licensing (AEC), Washington,

Available from NTIS, Springfield, Va., as Docket 50387-40; \$7.60 per copy, \$1.45 microfiche. Report No. Docket 50387-40, June 1973. 323 p, 41 fig, 48 tab, 181 ref, 6 append.

Descriptors: *Susquehanna River, *Nuclear powerplants, Effluents, Environment, Adminis-

trative agencies, *Comprehensive planning, *Sites, Geology, Investigations, Hydrology, Seismology, Climatology, Meteorology, Ecology, Radioactive wastes, Water pollution, Water pollu-tion sources, Radioactive effects, Monitoring, Public health, Transportation, Beneficial use, Cost-benefit analysis, *Pennsylvannia. Identifiers: *Boiling water reactors, *Environmen-tal impact statements.

tal impact statements.

This final environmental statement relates to the proposed construction of the Susequehanna Steam Electric Station. This station is located on the Susquehanna River near Berwick in Luzerne County, Pennsylvania, and will employ two boiling water reactors. The exhaust steam will be cooled by water in a closed cycle circulated through two hyperbolic natural-draft cooling towers. All water used in the operation will be drawn from and ultimately discharged to the Susquehanna River. Environmental impacts are assessed and after consideration of alternatives an environmental benefit-cost summary was compiled. Environmental factors considered include climate, hydrology (surface water and ground water), ecology including aquatic life, cooling water supply and discharge, cooling towers, cooling lakes, spray ponds, radioactive chemical and toxic chemicals in effluent water. It is concluded to issue a construction permit for the facility subject to the following conditions: (1) Re-seed transmission rights-of-way. (2) Control iodine releases no not exceed 5 mrem annual through done to a ject to the following conditions: (1) Re-seed trans-mission rights-of-way. (2) Control iodine releases to not exceed 5 mrem annual thyroid dose to a child via the air-cow-milk pathway. (3) Submit a list of chemicals for cleaning purposes and a method of waste disposal for approval. (4) Imple-ment an environment monitoring program to deter-mine ecological effects. (5) Conduct a preopera-tional radiological monitoring program to establish a baseline. (6) Provide an analysis and plan of ac-tion to eliminate harmful effects found. (Houser-ORNL) ORNL) W73-13412

FINAL ENVIRONMENTAL STATEMENT RE-LATED TO CONSTRUCTION OF NINE MILE POINT NUCLEAR STATION UNIT 2. Directorate of Licensing (AEC), Washington,

Available from NTIS, Springfield, Va., as Docket No 50410-35; \$13.60 per copy, \$1.45 microfiche. Report No. Docket 50410-35, June 1973. 566 p, 27 fig, 43 tab, 136 ref, 13 append.

Descriptors: "Nuclear powerplants, "Effluents, Environment, Administrative agencies, "Comprehensive planning, "Sites, Geology, Investigations, Hydrology, Seismology, Climatology, Meteorology, Ecology, Radioactive wastes, Water pollution, Water pollution sources, Radioactive effects, Monitoring, Public health, Transportation, Beneficial use, Cost-benefit analysis, "New York, Lake Ontario.

Identifiers: *Boiling water reactors, *Environme tal impact statments.

This final environmental statement was prepared in compliance with the National Environmental Policy Act and relates to the proposed construc-tion of the Nine Mile Point Nuclear Station Unit 2. tion of the Nine Mile Foint Nuclear Station Ont Z.
The station is located in Scriba, New York, and
will employ a boiling water reactor cooled by
once-through water drawn from and discharged to
Lake Ontario. The discharge will be combined
with Unit No. I discharge. Environmental impacts
are assessed and after consideration of alternaare assessed and after consideration of alterna-tives an environmental benefit-cost summary was complied. Environmental factors include hydrolo-gy (surface water and ground water), ecology in-cluding aquatic life, cooling-water supply and discharge, cooling towers, cooling lakes, spray ponds, radioactive chemical and sanitary wastes, amount of dissolved oxygen and toxic chemicals in effluent water. The conclusion is to issue a construction permit subject to the following condi-tions: (1) Provide a biological sampling program for ecological data; (2) conduct a monitoring and sampling program at intakes to determine fish kill; (3) conduct a preoperational radiological monitor-ing program for base line evaluations; (4) imple-ment a surveillance program to determine warment a surveillance program to determine ur ticipated effects. (Houser-ORNL) W73-13413

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ACTIVATION ANALYSIS OF TRACE ELE-MENTS IN BIOLOGICAL MATERIALS, (ANALYSE PAR ACTIVATION DE MECROQUANTITIES D'ELEMENTS DANS LES MATERIAUX BIOLOGIQUE), For primary bibliographic entry see Field 05A. W73-13420

OCCURRENCE OF SE75 AND SN113 IN OYSTERS, Bhabha Atomic Research Centre, Bombay (India). Health Physics Div.
For primary bibliographic entry see Field 05A.
W73-13424

DIETARY INTAKE OF COBALT BY THE ADULT POPULATION OF TARAPUR, Tarapur Atomic Power Station (India). For primary bibliographic entry see Field 05B. W73-13426

LABORATORY OBSERVATIONS ON THE EARLY GROWTH OF THE ABALONE, HALIOTIS SORENSENI, AND THE EFFECT OF TEMPERATURE ON LARVAL DEVELOOMENT AND SETTLING SUCCESS,

Scripps Institution of Oceanography, La Jolla,

D. L. Leighton. Fishery Bulletin, Vol 70, No 2, p 373-381, 1972. 6 fig. 1 tab. 16 ref.

*Growth rates, *Temperature, *Shellfish, *Larvae, Biology, Aquatic animals, Aquatic environment, Metabolism, Mortality, Nutrients, Growth stages, Environmental effects, Laboratory tests.
Identifiers: *Abalone.

The influence of temperature on larval develop-ment rate and growth of juveniles of the white or Sorensen's abalone, Haliotis sorenseni, was in-Sorensen's abalone, Haliotis sorenseni, was investigated using a thermal gradient apparatus. While larvae developed most rapidly at 20C, most settled juveniles at that temperature did not survive. At 15 to 16 C, however, the operculate veliger stage was attained in 72 hours and settlement of advanced individuals occurred in 9 days. No settling was observed at 10 C. Juveniles maintained at 15 to 19 C and provided mixed diatoms as food showed marked variability in growth rate; at 130 days shell length ranged from 4.0 to 8.0 mm (average 5.5 mm). Two distinctly different patterns of shell pigment distribution emerged with continued growth. Approximately 60% of the juveniles were bicolored, red and yellow-green, while the remainder had an even tone of red-violet. (Jerome-Vanderbilt) e-Vanderbilt)

CHANGE IN FEEDING AND BODY CONDI-TION OF BROWN BULLHEADS OVERWIN-TERING IN THE HEATED EFFLUENT OF A POWER PLANT, ESSEX MARINE Lab., CONN.

R. R. Massengill. Chesapeake Science, Vol 14, No 2, p 138-141, 1973. I fig, I tab, 10 ref.

Descriptors: *Winter, *Growth rates, *Food habits, *Bullheads, *Heated water, Thermal pollution, Environmental effects, Fish, Fish behavior,

Seasonal, Feeding rates, Aquatic environment, On-site data collections, Evaluation, Electric

Winter food habits and condition factors of the brown builhead, Ictalurus nebulosus, were determined from specimens collected in the discharge canal of the Connecticut Yankee Atomic Company plant and Chapman Pond, a cove of the Connecticut River unaffected by artificial heating. Stomach content analysis indicated that fish overwintering in the heated discharge fed, while those in water at 2 C from Chapman Pond did not. Fish, annelids, insects, molluscs and zooplankton were consumed, with fish as the most abundant food. Builheads began feeding before the temperature reached 4 C in Chapman Pond. The normal bullhead diet of invertebrates shifted to smaller fish in the densely populated canal. Although bullheads in the canal fed throughout the winter, their body condition was poorer than that of fish overwintering in Chapman Pond. (Jerome-Vanderbilt)

OYSTER HERPES-TYPE VIRUS,

National Marine Fisheries Service, Oxford, Md. Middle Atlantic Coastal Fisheries Center. W. G. Banfield, G. Kasnic, Jr., and W. S. Foster. Science (Wash). Vol 178, No 4062, p 759-760. 1972.

Illus. Identifiers: Crassostrea-virginica, *Herpes-type virus, *Oysters, *Viruses, Invertebrates.

A herpes-type virus infection, the first to be foun in an invertebrate animal, is reported in the oyster Crassostrea virginica. Intranuclear herpes-type viral inclusions were more prevalent in the virial inclusions were more prevalent in the Oyster at elevated water temperatures of 28 -30 C than at normal ambient temperatures of 18 -20 C. The inclusions were associated with a lethal disease at the elevated temperatures.—Copyright 1973, Biological Abstracts, Inc. 1973, 1943.

ECOLOGICAL COMPARISONS OF THER-MALLY AFFECTED AQUATIC ENVIRON-

Savannah River Ecology Lab., Aiken, S.C. E. D. Parker, M. F. Hirshfield, and J. W. Gibbons. Journal Water Pollution Control Federation, Vol 45, No 4, p 726-733, April 1973. 1 fig, 3 tab, 13 ref, 3 append.

Descriptors: *Nuclear power plants, *Thermal pollution, *Effluents, *Environmental effects, Electric power production, Water pollution, Heated water, Aquatic environment, Aquatic plants, Fish, Reptiles, *South Carolina, Reservoirs, Evaluation. Identifiers: Par Pond (So Car).

A study is reported of three reservoirs, located near the U.S. Atomic Energy Commission's Savannah River electric power plant at Aiken, S.C., which are differently affected by the thermal effluent from nuclear reactors. These reservoirs effluent from nuclear reactors. These reservoirs were chosen because they were isolated from human interference and indicated no evidence of chemical pollution. The object was to obtain information on species composition and the relative abundance of certain biological components (vascular aquatic plants, fishes, and reptiles). One reservoir received thermal effluent, another was recovering after intense thermal loading, and the third had no direct elevation of water temperature. One effect of thermal loading was the elimination of several species of vascular aquatic plants and vertebrates which was still evident several years after heating had been terminated. Relative vertebrates which was still evident several years after heating had been terminated. Relative abundance of other plant species was consequently enhanced, possibly as a result of reduced competition from other species. Appendix I lists the vascular aquatic plant species found in the three reservoirs. Appendix II lists the fish species. Appendix III lists the reptile species. (Jerome - Vanderbilt)

W73-13439

THE SEASONAL TEMPERATURE SENSITIVI-TY OF SOME TROPICAL MARINE FISH, Smithsonian Tropical Research Inst., Balboa, Canal Zone.

Physiological Zoology, Vol 45, No 1, p. 1-13, January 1972. 7 fig, 6 tab, 17 ref.

Descriptors: "Seasonal, "Cold resistance, "Heat resistance, "Tropical regions, "Marine fish, Biolo-gy, Animal physiology, Adaptation, Temperature, Aquatic environment, Metabolism, Respiration, Mortality, Oxygen demand.

Seasonal changes in upper and lower lethal temperatures have been measured in four ecologically different species of tropical marine fish. Also two species were monitored for seasonal changes in their oxygen consumption rates and the oxygen consumption rates of three species were measured after they had been acclimated to 17C for at least 6 weeks. None of 'the species studied makes easonal temperature compensations such as those commonly found in temperate-zone fishes. All fish studied were capable of acclimating to 17C, but the extent of the capacity and resistance adaptations varies for each species and is related to differences in littoral distribution. A positive correlation between upper lethal temperature and habitat temperature of Abudefdut troschelii from different locations, the wide range of thermal ferent locations, the wide range of thermal tolerances found for the species studied and their capacity for cold acclimation attest to the eurythermality of tropical marine species. (Jerome-Vanderbilt)

INFLUENCE OF PHENOL AND TEMPERA-

TURE ON THE RESPIRATION OF A FRESH-WATER SNAIL HELISOMA TRIVOLVIS, Rutgers-The State Univ., New Brunswick, N.J. Dept. of Zoology.

M. J. Sheanon, and F. B. Trama. Hydrobiologia, Vol 40, No 3, p. 321-328, 1972. 1 fig, 1 tab, 22 ref.

Descriptors: *Thermal pollution, *Invertebrates, *Phenols, *Inhibitors, *Respiration, Biochemistry, Water pollution, Environmental effects, Aquatic environments, Aquatic animals, Bethnic fauna, Freshwater, Pollutants, Heat, Metabolism, Lebentte Managaraneae, Evaborition Laboratory tests, Measurement, Evaluation,

The interactive influence of temperature and phenol (p-hydroxy benzene) on the rate of oxygen uptake for a freshwater snail, Helisoma trivolvis was investigated. Snails were collected en masse in early July 1969, and held in aquaria in dechlorinated tap water at 15 C. Twenty-four hours before tests, snails were transferred to hours before tests, snains were transferred to another tank. Oxygen consumption was measured factorially at 0, 2.0, 20.0 and 40.0 mg/liter of phenol and at 5, 15 and 25 C temperatures. The analysis of variance indicated a highly significant value for the influence of phenol on oxygen up-take. This was most evident at 15 and 25 C; metabolic rate at 5 C was so slowed down that differences were impossible to measure. It appeared that all three phenol levels had a more or less uniform effect on oxygen consumption. The slow down of metabolic activities due to low tempera-tures was of the same magnitude as that due to a deleterious chemical. Snails exposed to as much as 40 mg phenol/liter for the three to four hour test period apparently recovered fully when returned to clean river water. (Jerome-Vanderbilt)

THE EFFECT OF TEMPERATURE ON THE DEVELOPMENT RATE OF THE MAJOR LIFE

STAGES OF DIAPTOMUS PALLIDUS HER-RICK, Missouri Univ., Columbia. Div. of Biologica:

Sciences.
W. T. Geiling, and R. S. Campbell.
Limnology and Oceanography, Vol 17, No 2, p. 304-307, March 1972. 2 fig, 14 ref. WP-00379.

Descriptors: *Temperature, *Growth rates, Descriptors: "temperature, "Growth table, "Animal physiology, Juvenile growth stages, Invertebrates, Physiology, Biology, Environmental effects, Lakes, Eutrophication, "Copepods. Identifiers: Development rate, "Eggs, Life stages, "Neutrony apilidus." *Diaptomus pallid

Diaptomus pallidus Herrick were raised from the egg to adulthood at 10, 15, 20 and 25C under ad egg to adulthood at 10, 15, 20 and 25C under ad libitum feeding conditions. Times spent in the egg, nauplius, and preadult life stages were recorded. Egg to adult times ranged from 66.2 days at 10°C to 14.6 at 25°C. Development rate plateaued between 15 and 20°C, largely because of the similarity in time spent in the preadult copepodid stages. Such a plateau, well documented for other temperature related abusilogical functions is invest herete. a plateau, well documented for other temperature related physiological functions in invertebrates, is inconsistent with the suggestion that it may be possible to predict the entire range of temperature response of development rate for all stages of copepods using Belehradek's equation with certain maintal measurements. (Oleszkiewicz-Van-W73-13456

INVERSE COMPENSATION FOR TEMPERA-TURE IN OXYGEN CONSUMPTION OF THE HYLID FROG PSEUDACRIS TRISERIATA. Colorado State Univ., Fort Collins. Dept. of

G. C. Packard.

Physiological Zoology, Vol 45, No 3, p. 270-275, 1972. 1 fig. 3 tab, 23 ref.

Descriptors: *Metabolism, *Frogs, *Respiration, **Temperature, Biology, Animal physiology, Oxygen demand, Adaptation, Environmental effects, Resistance, Laboratory tests.

This investigation tests the hypothesis that, because the chorus frog (Pseudacris triseriata) remains active at low temperatures, partial compensation for temperature might be expected as a pattern of metabolic response to low temperature ation. Following acclimation to 5C or to 25C for at least 4 days, oxygen consumption of chorus frogs was measured at 10C or 20C by differential respirometry. Short-term compensation for tem-perature conformed with the pattern of inverse translation, frogs acclimated at the low temperature having lower metabolic rates than frogs acclimated at the high temperature. There is reason to mated at the high temperature. Here is reason to believe that a temperature of 5C may have been sufficiently low to induce cold torpor in the animals, in which case inverse compensation may have been an adaptive response permitting conser-vation of energy reserves. (Jerome-Vanderbilt)

EFFECTS OF TEMPERATURE, SALINITY, AND DISSOLVED OXYGEN ON THE SUR-VIVAL OF STRIPED BASS EGGS AND LAR-

VAE, California State Dept. of Fish and Game, Sacramento. Anadromous Fisheries Branch.
J. L. Turner, and T. C. Farley.
California Fish and Game, Vol 57, No 4, p. 268-

273, 1971. 4 tab, 8 ref.

Descriptors: "Striped bass, "Temperature, "Salinity, "Dissolved oxygea, "Reproduction, Water quality, Aquatic environment, Environmental effects, Fish eggs, Life cycles, Fish physiology, Laboratory tests, Test procedures, Measurements, Evaluation.

Group 5C-Effects of Pollution

Laboratory tests were conducted to define the ef-fects of temperature, salinity and dissolved ox-ygen on the eggs and larvae of striped bass in order to find what measures must be taken to protect the ygen on the eggs and larvae of striped oass in order to find what measures must be taken to protect the species from the increasing degradation of the freshwater environment. Adult striped bass were collected during their spawning migration and female fish were induced to ovulate. Eggs were female fish were induced to ovulate. Eggs were collected, dry fertilized and placed into test containers. Some eggs were placed directly into test conditions, and others were water hardened first. Eggs were incubated at 18 salinity-temperature combinations. For the eggs placed directly into test conditions the survival was 88% or more of control in total dissolved solids of 1000 ppm. The highest survival occurred at 1000 ppm and 65 F, but survival decreased at 1000 ppm and 65 F, but survival decreased rapidly above 1000 ppm. but survival decreased rapidly above 1000 ppm, especially at higher temperatures. The survival of eggs hardened in fresh water was higher at greater salinities and temperatures. In test of the effective nities and temperatures. In tests of the effects of dissolved oxygen-temperature, egg survival decreased with an increase of temperature or ex-posure time or a decrease in dissolved oxygen level. These experiments suggest that even posure time of a decrease in dissolved oxygen level. These experiments suggest that even moderate reductions of dissolved oxygen adverse-ly affect the percents hatch of eggs and larvae sur-vival. (Jerome-Vanderbilt) W73-13460

THE EFFECT OF TEMPERATURE ON THE NUMBER OF CIRCULATING HEMOCYTES IN THE CALIFORNIA SEA HARE, APLYSIA CALIFORNIA, National Marine Fisheries Service, Oxford, Md.

Biological Lab. G. B. Pauley, and S. M. Krassner. California Fish and Game, Vol 57, No 4, p 308-

309, 1971. 1 tab, 4 ref.

Descriptors: *Temperature, *Mollusks, *Metabolism, *Biological indicators, Aquatic environment, Animal physiology, Aquatic animals, Laboratory tests, Testing procedures, Measurements, Evalua-

Identifiers: Blood cell count

It was necessary to know the number of circulating hemocytes in the California sea hare in order to evaluate experimental results or pathological conditions. Observations of the total number of circulating blood cells at two different temperatures were made to obtain the needed information. Hemolymph was drawn from the engorged pedal sinus in 16 different animals of approximately equal size which had been held at 12 and 18 C for 1 equal size which has deen near a rain and we week. This operation could be performed without trauma if the animal was held in a damp paper towel. The hemolymph was kept in sterile test tubes in an ice bath until cells were counted. Four counts were taken from each animal. Although the range of total hemocyte counts overlapped somewhat, the mean number of hemocytes present at 18 C (146-47 plus or minus 40.70) was please which twice the number observed at 12 C (76.03 plus or minus 20.86). The total hemocyte values found in the California sea hare differ from those obtained for other mollusks, but, the temperature sensitivity compared favorably to studies of others. (Jerome - Vanderbilt)

RESEARCH NEEDS ON WASTE HEAT TRANSFER FROM LARGE SOURCES INTO THE ENVIRONMENT.

Illinois State Water Survey, Urbana. For primary bibliographic entry see Field 05G.

TEMPERATURE-DEPENDENCE OF PERMEA-BILITY TO WATER AND TO SODIUM OF THE GILL EPITHELIUM OF THE EEL ANGUILLA

ANGUILLA, Nice Univ. (France). Faculte des Sciences.

R. Motais, and J. Isaia.

Journal of Experimental Biology, Vol 56, No 3, p 587-600, June 1972. 2 fig, 6 tab, 31 ref.

Descriptors: *Eels, *Temperature, *Permeability, *Sodium, Biochemistry, Aquatic environment, Sea water, Freshwater, Aquatic animals, Metabol-ism, Diffusion, Flow, Transmissivity, Solutes, Evaluation, Animal physiology, Laboratory tests. Identifiers: Blood, Gill.

In the eel, the gill rather than the skin is the principal water exchange surface. Previous results indicate that water crosses the gill of marine fish by simple diffusion and not by bulk flow. This study is an attempt to evaluate the importance of a possible solute-solvent interaction in the branchial ble solute-solvent interaction in the branchial epithelium of the seawater-adapted eel. The ratio of water permeability to sodium permeability is about 3 at 25 C, but drops to 1 at 5 C. This drop is mainly due to diminution of the water permeability. The relatively independent variations of permeabilities in the seawater-adapted fish indicate a certain dissociation between water and the measurement. salt movements. The hypothesis concerning the presence of water-filled channels in the branchial epithelium of fresh water-adapted eels is supported. In the seawater-adapted eel the osmotic permeability is considerably higher than the diffusional permeability with the difference being greater the lower the temperature. This surprising result must signify either that the osmotic pressure difference between blood and seawater does not represent the true osmotic gradient or that a reab-sorption of water linked with solutes occurs in a specialized region of the gill. (Jerome - Vanderbilt)

THERMAL EFFECTS ON AQUATIC ORGAN-

INISMS, ANOTATED BIBLIOGRAPHY OF 1971 LITERATURE, Oak Ridge National Lab., Tenn. C. C. Coutant, E. E. Huber, and H. A. Pfuderer. Available from the National Technical Information Service as ORNL-EIS-72-28, \$3.00 in paper copy, \$1.45 in microfiche. Report ORNL EIS 72-28, September 1972. 155 p, 404 ref.

Descriptors: *Thermal pollution, *Environmental effects, *Aquatic life, *Bibliographies, Water quality, Temperature, Aquatic environment, Adagae, Bacteria, Annelids, Biomass, Biochemistry, gae, Bacteria, Anneilos, Biomass, Biochemistry, Behavior, Metabolism, Reproduction, Respira-tion, Growth rates, Fish, Laboratory tests, On-site tests, Measurements, Data collections, Evalua-tion, Feeding rates, Estuaries, Streams, Rivers, Lakes, Ponds, Oceans.

A review of the literature of 1971 dealing with the problem of thermal effects on aquatic organisms is presented. Abstracts of 404 articles are included presented. Abstracts of 404 articles are included on the following topics: reviews; site studies; producers, including effects on growth and production, and community responses; consumers, including reproduction and development, distribution, temperature tolerance, physiology of cold shocks, tissue and organ responses, growth, food transport, temperature-salinity interactions, radionuclide uptake, temperature and other stresses, feeding rates, preferred temperature, avoidance, orientation, activity, and predator prey relations; decomposers; disease: beneficial uses: relations; decomposers; disease; beneficial uses; and bibliographies. Indexes of authors, key words and taxonomic names, are presented, along with a key-word-in-context index on titles. (Jerome - Vanderbilt) Vanderbilt) W73-13478

THE USE OF WATER QUALITY SIMULATION MODELS IN THE ANALYSIS OF THE THER-MAL EFFECTS PROBLEM.

RAND Corp., Santa Monica, Calif. For primary bibliographic entry see Field 05B. W73-13479

A STUDY OF THE BLUE-GREEN ALGAE FROM PADDY FIELD SOILS OF INDIA, Allahabad Univ. (India). Dept. of Botany.

G. L. Tiwari. Hydrobiologia, Vol 39, No 3, p 335-350, May 15, 1972. 3 tab. 24 ref.

Descriptors: "Cyanophyta, "Systematics, "Soil algae, Soils, Sampling, Cultures, Bioindicators, Anabaena, Nostoc.

Identifiers: "India, Sample preservation, Sample preparation, Culture media, Enrichment, Agars, Microcystis spp, Gloeocapsa rupestris, Gloeothece rupestris, Aphanocapsa spp, Aphanothece spp, Dacylococcopsis fascicularis findica, Chamaesiphon rostafinskii, Arthrospira gomontiana var crassa, Spirulina major, Oscillatoria snn., Phormidium snn., Lynebya snn., Miclatoria snn., Phormidium snn., Lyne gomontiana var crassa, Spirulina major, Oscillatoria spp., Phormidium spp., Lyngbya spp., Microcystis flos-aquae, Gloeothece spp., Aphanothece
stagnina, Chroococcidiopsis myaorensis, Oscillatoria spp., Phormidium spp., Microcoleus spp.,
Cylindrospermum spp., Nostoc spp., Anabaena
spp., Scytonema spp., Microchaete spp.,
Gloeotrichia spp., Hapalosiphon spp., Aulosira
spp., Plectonema spp., Scytonematopsis
ghazipurensis, Tolypothrix spp., Calothrix spp.,
Symphyonemopsis katniensis, Hapalosiphon spp.,
Westiellopsis prolifica.

Westiellopsis prolifica.

Soil samples and algae were collected from rice fields in India in order to study the blue-green algae. Collections were taken to a depth of one inch and were kept in sterilized Petri dishes for preparation of enrichment cultures. Blue-green algae found growing in the cultures were recorded and unialgal cultures obtained by direct isolation or by streak cultures. A total of 132 forms were reported including one new genus, three new species, three new varieties, and 14 new form variants. Of the total, 37.8 percent were from nature, 48.4 percent obtained from culture, and 13.6 percent common to both. The study confirms earlier observations that soils contain a large number of viable algal species apart from those actually visible and that some algae reported from nature may fail to appear under cultural conditions. The heterocystous blue-green algae are seen less than non-heterocystous in nature whereas in cultures the condition is reversed. (Mortland-Battelle) W73-13498 the condition
W73-13498

THE INTERACTION OF LIGHT INTENSITY AND DDT CONCENTRATION UPON THE MARINE DIATOM, NITZSCHIA DELICATIS-SIMA CLEVE,
Florida State Univ., Tallahassee. Dept. of

Oceanography.
R. B. MacFarlane, W. A. Glooschenko, and R. C.

Harriss. Hydrobiologia, Vol 39, No 3, p 373-382, May 15, 1972. 3 fig, 13 ref.

Descriptors: *DDT, *Light intensity, *Phytoplankton, *Primary productivity, Chlorinated hydrocarbon pesticides, Photosynthesis, Water pollution effects, Chlorophyll, Carbon, Cultures, Radioactivity techniques, Absorption, Chrysophyta, Marine algae, Carbon radioisotopes, Identifiers: Nitzschia delicatissima, Chlorophyll a,

A study was conducted to determine the effects of the interactions between DDT concentration and light intensity on marine phytoplankton with respect to carbon-14 uptake, chlorophyll a content, and photosynthesis. Cultures of Nitzachia delicatissima were grown to concentrations of 75,000 cells per ml and DDT was then introduced in concentrations of 94, 225, 544, 88, 220, 500, and 1,000 ppb. Fifty-ml aliquots were placed in a growth chamber at the desired light intensity and incubated for 24 hours and carbon-14 or chlorophyll a analysis was done. A consistent reduction in both C-14 fixation and chlorophyll a was observed with increasing DDT concentrations. Maximum reductions occurred at the highest A study was conducted to determine the effects of

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A Rhiz anchor was pa larly to RhEa stomat emerse (Hydro (14011) RhEa,

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light intensities. However, since the lowest DDT concentrations used were at least 100 times those reported in an estuarine study, it was concluded that inhibition of primary production is probably not occurring in nature except for very limited areas, and then only in surface waters. (Mortland-Battelle) W73-13500

PATHOGENICITY OF FUNGI AND BACTERIA FROM INDIA TO HYDRILLA AND WATER-HYACINTH,

HYACINTH, Florida Univ., Gainesville. Dept. of Plant Patholo-

R. Charudattan.

R. Chardelean. Hyacinth Control Journal, Vol 11, p 44-48, June 1973. 3 fig, 3 tab, 9 ref. OWRR B-011-FLA (8), 14-31-0001-3268.

Descriptors: Plant pathology, "Aquatic weed control, Biocontrol, "Pathogenic fungi, "Pathogenic bacteria, "Water hyacinth. Identifiers: "India, "Hydrilla.

A search was made recently in India for pathogens of hydrilla and waterhyacinth for biological control purposes. Several fungi and bacteria were isolated from surface-sterilized shoots and leaves of these plants that were diseased or suspected to be so. These organisms were brought to the University of Florida and studied in a quarantine glasshouse. Pathogenicity tests with 40 fungi and 15 bacteria revealed that a Pythium and a Sclerotium species were damaging to hydrilla. Among 32 fungi and 6 bacteria from waterhyacinth, Alternaria eichhorniae, Myrothecium roridum and Rhizoctonia solani were virulent on this host. These three fungi have been previously reported as pathogens of waterhyacinth in India. The pathogens of hydrilla found in this study as well as known pathogens of waterhyacinth will be assessed as biocontrol agents of these plants in Florida. (Morgan-Florida)

PATHOGENICITY OF RHIZOCTONIA SOLANI TO AQUATIC PLANTS, Florida Univ., Gainesville. Dept. of Plant Patholo-

gy. B. G. Joyner, and T. E. Freeman. Phytopathology, Vol 63, No 6, p 681-685, June 1973. 1 fig, 22 ref. OWRR B-011-FLA (9), 14-31m01.1256

Descriptors: Plant pathology, "Aquatic weed control, Aquatic plants, "Water hyacinth, "Pathogenic fungi, Biocontrol. Identifiers: "Panama, "Rhizoctonia solani.

A Rhizoctonia solani isolate (RhEa) from diseased anchoring hyacinth (Eichhornia azurea) in Panama was pathogenic to several aquatic plants, particularly to water hyacinth (E. crassipies) and water lettuce (Pistia stratioties). Penetrating hyphae of RhEa grew from infection cushions through the stomates of water hyacinth leaves. Only the emersed portions of water pennywort (Hydrocotyle umbellata) and water hyacinth were infected by RhEa. Another R. solani isolate (14011) infected both submersed and emersed portions of these two plants. Disease, caused by RhEa, in water hyacinth was severe at 28C, but as temperature was increased to 32C, disease severity decreased and little or no damage was detected. Disease severity in water hyacinth caused by another R. solani isolate (14287) was the same at both 38 and 32C. (Morgan-Florida)

THE KINETICS OF NH4 UPTAKE BY CERATOPHYLLUM, Oklahoma State Univ., Stillwater. Dept. of Zoology, D. W. Toetz.

Hydrobiologia, Vol 41, No 3, p 275-290, 1973. 7 fig, 5 tab, 11 ref. OWRR A-023-OKLA (1), 14-31-0001-3836.

Descriptors: Lakes, *Ammonia, *Kinetics, *Eutrophication, *Oklahoma, Aquatic plants, Nutrients, Model studies, Ponds. Identifiers: *Ceratophyllum.

The relationship between growth of aquatic plants and their nutrient supply is poorly understood, because of the lack of suitable models which could be tested in the field. The purpose of this research was to learn if the Michaelis-Menten expression describes the relationship between the uptake of NH4 in solution. A hyperbola results when uptake of NH4 by Ceratophyllum (v) is plotted against the concentration of NH4 in solution (S). The relationship is not described well by the Michaelis-Menten expression. Linear relationships exist between v and S at concentration less than 7 mg NH4-N (1)-1, suggests that a model for first order saturation kinetics might be appropriate. However, uptake is depressed by one half at low temperatures and some of the uptake is apparently related to processes which are not completely passive. The ecological usefulness of the Michaelis-Menten constants derived for Ceratophyllum is discussed. W73-13504

SOND CRUISE 1965: FACTOR AND CLUSTER ANALYSES OF THE PLANKTON RESULTS, A GENERAL SUMMARY, National Inst. of Oceanography, Wormley (En-

National Inst. of Oceanography, Wormley (England).
For primary bibliographic entry see Field 05A.

ESTABLISHMENT OF INVERTEBRATE COM-MUNITIES ON LOG SUBSTRATES IN THE KASKASKIA RIVER, ILLINOIS, Illinois State Natural History Survey, Urbana. H. C. Nilsen, and R. W. Larimore.

H. C. Nilsen, and R. W. Larimore. Ecology, Vol 54, No 2, p 366-374, Early Spring 1973. 2 fig, 4 tab, 5 ref.

Descriptors: *Deciduous trees, Natural streams, *Biological communities, *Invertebrates, *Periphyton, *Phytoplankton, Dominant organisms, Aquatic habitats, Aquatic insects, Larvae, Oligochaetes, Ponds, Shallow water, Water levels, Rotifers, Crustaceans, Nematodes, Mollusks, Annelids, Systematics, Standing crops, Aquatic drift, Cottonwoods, *Illinois, Biomass, Water chemistry, Air temperature, Water temperature, Turbidity, Dissolved solids. Identifiers: *Colonization, *Logs, *Kaskaskia River, Riffles, Water mites, Planarians, Substrates, Chironomids, Black flies, Populus deltoides, Ulmus americana, Acer saccharinum, Fraxinus americana, American elm, Silver maple, White ash, Aeolosoma, Ostracods, Seed shrimp, Platyhelminthes, Glochidia, Pond snails, Oedogonium, Melosira, Navicula, Cyclotlaria, Macronycus glabratus, Atrichopogon fusculus, Pleurocerca, Hemiptera, Water striders.

Development of invertebrate communities on log substrates was investigated in three habitats. In slowly moving, shallow water, standing crops (weights) of colonizing invertebrates followed a sigmoid growth curve during a 6-week exposure period. Initial colonization was rapid, followed by 2 weeks of slow growth, a rapid increase during the next 2 weeks, and then a leveling off at 1,650 mg/sq m during the final week. Numbers followed a similar pattern of growth, attaining a high of approximately 100,000/sq m by the end of the 5th week. Chironomid larvae colonized first and in the greatest numbers, followed sequentially by sessile rotifers and oligochaetes. These three organisms had the greatest influence on standing crops and total numbers. In a riffle, colonization was also rapid: 569 mg and 8,830 individuals per sq m at the

end of four weeks. The riffle community was dominated by Taeniopteryx nivalis, hydropsychid larvae, chironomid larvae, and simuliid larvae. In a pool, the standing crop was largest on logs at an intermediate depth, next largest near the surface, Acolosoma sp., attained their largest population on logs at the greatest depth, while chironomid larvae and taeniopterygid naiads attained their largest population on logs at the greatest depth, while chironomid larvae and taeniopterygid naiads attained their largest populations at or above the intermediate depth. Communities on naturally occurring logs contained more planaria and insects of the families Hydropsychidae, Heptageniidae, and Elmidae than on the experimental logs in slowly moving, shallow water. Communities on the introduced logs did not reach a climax stage during the experimental period because organisms, organic detritus, and silt were constantly accumulating or sloughing off, the substrate was slowly decomposing, and changes were occurring seasonally in the chemical and physical condition of the water, all of which modified the habitat and influenced community development. (Holoman-Battelle)

ENERGY FLOW IN A WOODLAND STREAM ECOSYSTEM: II. THE TAXONOMIC COMPOSITION AND PHENOLOGY OF THE CHIRONOMIDAE AS DETERMINED BY THE COLLECTION OF PUPAL EXUVIAE, Pittsburgh Univ., Pa. Pymatuning Lab. of Ecolo-

gy, W. P. Coffman. Archiv fur Hydrobiologie, Vol 71, No 3, p 281-322, March 1973. 11 fig, 6 tab, 45 ref.

Descriptors: *Life cycles, *Systematics, *Phenology, *Biorhythms, *Pennsylvania, *Midges, Biological communities, Invertebrates, Benthic fauna, Aquatic insects, Life history studies, Growth stages, Period of growth, Energy conversion, Diptera, Aquatic drift, Sampling, Water temperature.

Identifiers: *Linesville Creek, Species diversity,

Identifiers: *Linesville Creek, Species diversity, Macroinvertebrates, Drift organisms, Flies, Emergence, Acricotopus, Brillia ef. brevinervis, Cardiocladius, Corynoneura, Cricotopus spp, Corynoneura-Thienemanniella, Diplocladius, Epoicocladius, Eukiefferiella (Akiefferiella sieukiefferiella brevicalcar, Eukiefferiella discoloripes, Heleniella, Eukiefferiella lobifera, Eukiefferiella spp, Heterotrissocladius spp, Krenosmittia cf. camptophleps, Limnophyes, Metriocnemus, Microcricotopus spp.

The taxonomic composition and phenology of the chironomid community of a small woodland stream in eastern Northern America were investigated by the utilization of natural collections vesugated by the tanzanato of surface of rifting pupal exuviae. Based on pupal identifications 143 chironomid taxa were recognized: Orthocladinae (83), Chironomini (25), Tanytarsini (21) and Tanypodinae (14). A total of 34 patterns of emergence were summarized in six major and three minor types. Almost all Orthocladiinae species had an emergence period in the late winter to mid-spring months. The other major taxa generally appeared later with the Chironomini and Tanypodinae being the most extreme. The onset of mergence of the major taxa coincided sharply with the spring water temperature increase, the at-tainment of the maximum summer temperature and the period of maximum diel temperature fluctuation. Preliminary experiments on the decom-position of exuviae indicate that they remain floating for about two days. The quantification of the ecting method is discussed in conjunction with its possible use in benthic production studies. A short review of recently published work on the chironomid pupal life stage is included. (See also W71-10064). (Little-Battelle)

Field 05-WATER QUALITY MANAGEMENT AND PROTECTION Group 5C-Effects of Pollution

IDENTIFICATION BY MEANS OF RETENTION

PARAMETERS, Max-Planck-Institut fur Kohlenforschung, Muelheim an der Ruhr (West Germany). For primary bibliographic entry see Field 05A. W73-13511

THE SIGNIFICANCE OF HYDROCARBON AS-SIMILATION IN YEAST IDENTIFICATION, Technische Hogeschool, Delft (Netherlands). Lab. of Microbiology. For primary bibliographic entry see Field 05A.

DIFFERENTIATION OF MYCOBACTERIUM TUBERCULOSIS FROM OTHER MYCOBACTERIA BY SUSCEPTIBILITY TO ETHYL AND METHYL ESTERS OF P-NITROBENZOIC

ACID, Chubu Chest Hospital, Obu (Japan).

M. Tsukamura. Japanese Journal of Microbiology, Vol 17, No 1, p 81-82, January 1973. 1 tab, 4 ref.

Descriptors: "Separation techniques, "Cultures, "Mycobacterium, Pathogenic bacteria, Growth rates, Inhibitors, Resistance. Identifiers: "Nitrobenzoate, Culture media, p-Nitrobenzoate acid ethyl ester, Nitrobenzoate acid methyl ester, Mycobacterium spp.

Studies have shown that p-nitrobenzoate is useful Studies have shown that p-introbenzoate is userum in screening for atypical mycobacteria (other than tubercle bacilli). Since p-nitrobenzoate is not commercially available the present study was conducted to find commercial chemicals to serve the same purpose. The chemicals studied were the ethyl and methyl esters of p-nitrobenzoate. Twenty-two species of mycobacteria were cultured in ty-two species of mycobacteria were cultured in Ogawa egg medium containing one of the two compounds in concentrations of 0.25 or 0.5 mg/ml. Almost all mycobacteria except Mycobacterium tuberculosis and Mycobacterium bovis were resistant to the compounds. Mycobacterium bovis was able to grow on the medium containing 0.25 mg/ml of either compound whereas Mycobacterium tuberculosis usually was not. Using a medium containing 0.25 mg/ml ethyl ester of pritrobenzoate, 26 strains of a typical mycobacteria other than Mycobacterium tuberculosis were detected from a stolal of 370 unknown mycobacteria. tected from a total of 370 unknown mycobacteria. (Little-Battelle)

CONSERVATION OF THE GREAT LAKES OF EAST AFRICA: A LESSON AND A WARNING, Freshwater Biological Association, Ambleside (England). For primary bibliographic entry see Field 02H. W73-13517

THE INFLUENCE OF ENVIRONMENTAL FAC-TORS ON THE DISTRIBUTION OF FRESH.
WATER ALGAE: AN EXPERIMENTAL STUDY.
I. INTRODUCTION AND THE INFLUENCE OF CALCIUM CONCENTRATION, Michigan State Univ., East Lansing. Dept. of

Botany.

Journal of Ecology, Vol 60, No 3, p 917-932, November 1972. 3 fig, 7 tab, 109 ref. OWRR A-

Descriptors: "Distribution patterns, "Trophic level, "Chlorophyta, "Chrysophyta, "Pyrrophyta, "Euglenophyta, "Cyanophyta, "Nutrient requirements, Bioassay, Reviews, Calcium, Cultures, Hardness (Water), Growth rates, Limiting factors, Alkalinity, Water quality. Identifiers: Culture media, Cryptomonads, Bacillaria, Closterium acerosum, Cosmarium, Desmidium swartzii, Gonatozygon monotaenium, Mesotaenium kramstai, Micrasterias spp, Pleu-

rotaenium trabecula, Roya anglica, Haematococcus droebakensis, Pleodorina californica, Pandorina morum, Volvox aureus, Pediastrum spp, Scenedesmus quadricauda, Eunotia, Synura petersenii, Peridinium, Zygnema spp, Chlamydomonas reinhardii, Ulothrix fimbriata, Nitzschia palea, Euglena gracilis, Trachelomonas grandis, Gloeocapsa, Gloeotrichia, Tolypothrix distorta var. sympiocides, .

This study has attempted to establish factors affecting the distribution of algae in hard and soft waters through a study of the cultural requirements of algae of known distribution in these waters. The natural distributions of the species used in the experiments are described, and the effects of some major cations on growth are examined. Introducing a series of papers examining the reasons for the distribution of feathwater allows. amined. Introducing a series of papers examining the reasons for the distribution of freshwater alga-in eutrophic and oligotrophic water, this paper out-lines the natural distribution of some of thirtylines the natural distribution of some of thirtythree species studies experimentally. Two groups
of species are objectively delineated, one
(oligotrophic) whose members are restricted to
waters with not more than 1.5 m-equiv/I weak acid
salts (Bicarbonate), the other (eutrophic) with
members present in waters with 0.4 or more mequiv/I weak acid salts. The ratio of monovalent
to divalent cations did not affect growth of five
test species. High calcium levels (100 mg/I) did not
reduce growth of oligotrophic desmids, and 1.0 mg
Ca (2 plus)/I was adequate for maximum growth
of sixteen species tested. Two oligotrophic
desmids required at least 1-3 mg Ca (2 plus)/I for
maximum growth. No evidence was found for the
contention that oligotrophic desmids are calciphobic. (Little-Battelle)
W73-13546

THE SEASONAL CYCLE OF PHEOPIGMENTS IN LAKE ONTARIO WITH PARTICULAR EMPHASIS ON THE ROLE OF ZOOPLANK-

TON GRAZING,
Department of the Environment, Burlington (Ontario). Centre for Inland Waters. W. A. Glooschenko, J. E. Moore, and R. A.

Vollenweider. Limnol Oceanogr. Vol 17, No 4, p 597-605, 1972.

Identifiers: Biomass, Canada, Cycle, *Lake, Ontario, *Pheo-pigments, Phytoplankton, Pigments, Seasonal, *Zooplankton grazing.

Seasonal, *Zooplankton grazing.

The annual cycles of chlorophyll a, pheo-pigments, and zooplankton in Lake Ontario were studied on 32 stations during 13 cruises in 1970. Highest amounts of chlorophyll a were found in inshore waters. The seasonal cycle of phytoplankton biomass as measured by chlorophyll a showed three patterns: a unimodal distribution in the deeper waters which are last to warm up in late spring; a bimodal pattern, with spring and fall peaks, mainly along the central basin and north and south shores; a series of 3 pulses in nutrient: hareas and in the warmer eastern region of the lake. Zooplankton biomass increased eastward in the direction of increasing heat content. Pheo-pigments were low during the spring increase of phytoplankton, but their amount relative to that of chlorophyll a was significantly correlated (r ± +0.896) with zooplankton abundance. Highest pheo-pigments were found in the eastern basin of the lake. The need to correct chlorophyll a values for pheo-pigments is emphasized especially when zooplankton grazers are abundant.—Copyright 1973, Biological Abstracts, Inc.

CHANGES DURING FOUR YEARS IN THE AQUATIC MACROVEGETATION IN A FLAD IN NORTHERN STOCKHOLM ARCHIPELAGO, ea Univ. (Sweden). Dept. of Biology undegardh-Ericson.

Sven Bot Tidskr. Vol 66, No 3, p 207-225. 1972. Il-

Identifiers: *Aquatic plants, Ceratophyllum-Demersum, Chara-Tomentosa, *Flad, Myriophyl-lum-Spicatum, Najas-Marina, Oxygen, Phosphorus, Phragmites-Communis, *Sweden (Stockholm Archipelago), Vegetation, Bays, Hydrogen ion concentration.

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Aquatic macrovegetation was studied and mapped in a shallow sheltered bay (sw. flad) in northern Stockholm Archipelago, central Sweden, during the years 1966-1969. The flad is surrounded by a thick girdle of mostly Phragmites communis. The submerged vegetation is characterized by large meadows of Chara tomentosa and Najas marina. During the first 3 yr, it also consisted of luxuriant stands of Myriophyllum spicatum and Ceratophyllum demersum. The bottom consists of gyttja, with the exception of a small area near the southern shore. The distribution and changes of 16 aquatic species are discussed, together with water analyses of pH, oxygen and total-P.—Copyright 1973, Biological Abstracts, Inc. W73-13380

THE EFFECT OF THE WATER FACTOR IN SPREADING INTESTINAL INFECTIONS, (IN RUSSIAN),

C. Chumalo, and V. S. Kitel'.

P. G. Chumalo, and V. S. Kitel'. Zh Mikrobiol Epidemiol Immunobiol. Vol 49, No 2, p 143-144. 1972.

Identifiers: Human infections, *Intestinal infec-tions, Microorganisms, USSR, *Etiological fac-

The etiological factors and the possible effect on The etiological factors and the possible effect on the spread of water borne diseases in the Western region of the river Bug are described. Based on data obtained from a sanitary-epidemiological sta-tion of the region, the various outbreaks of the dis-ease were linked with the water of the river Bug and its tributaries. The chemical composition of groups and certain sanitary recommendations for the future are presented.—Copyright 1973, Biologi-cal Abstracts, Inc. W72.1526

ASPINA TRIUM GALLIENI N. SP. (MONOGENA, POLYOPISTHOCOTYLEA) PARASITE OF STRONGYLURA ACUS

MUNUGENA, POLYOPISTHOCOTYLEA)
PARASITE OF STRONGYLURA ACUS
LACEPEDE 1803, (IN FRENCH),
Montpellier Univ. (France). Laboratoire de Parasitologie Comparee.occiylea) Parasite of Strongylura Acus Lacepede 1803, (In French),
For primary bibliographic entry see Field 021.
W73-13590

OXIDATION REDUCTION POTENTIALS, OX-YGEN CONCENTRATION AND OXYGEN UPTAKE OF PROFUNDAL SEDIMENTS IN A EUTROPHIC LAKE,
Bedford Inst., Dartmouth (Nova Scotia). Marine

Bedford Inst., Dartmount (1907a Schaller)
Ecology Lab.
B. T. Hargrave.
Oikos. Vol 23, No 2, p 167-177. 1972. Illus.
Identifiers: *Denmark (Lake Esrom), *Eutrophic lakes, *Oxidation, Oxygen, *Sediments (Porfundal), Oxidation reduction.

Oxidation-reduction potentials were measured with a 1-mm platinum electrode in undisturbed sediment cores and re-settled mud from Lake Esrom, Denmark. Slow stabilization of Eh potentials occurred at the aerobic-anaerobic interfact Seasonal changes in Eh profiles in profundal sec rface. ments only occurred in the upper I cm during summer stratification. When O2 disappeared, reducing conditions reached the sediment surface. In artificial mud-water systems, no measurable O2 occurred when Eh values in either sediment, or water or both, fell below + 100 my. O2 uptake by mud taken from various depths of sediment cores was inversely related to Ep potential. Eh and the square root of O2 uptake by sub-surface mud dur-

Effects of Pollution-Group 5C

ing aeration showed a similar inverse propor-tionality, suggesting that intensity and capacity of O2 consumption are related. Formalin addition O2 consumption are related. Formain addition reduced O2 uptake by sediment from the surface of undisturbed cores by 80%. Below 1 cm all O2 was consumed by chemical processes. En potential may index both the intensity and capacity of such relations.—Copyright 1973, Biological Abstracts, Inc. W73-13599

EFFECTS ON CATTLE OF WATER CONTAIN-

ING DETERCENTS, Universidad Nacional Autonoma de Mexico, Mex-ico City. Facultad Medicina. M. V. Hornedo, and Alberto Stephano.

Vet (Mex City). Vol 2, No 1, p 2-42, 1971. Identifiers: Alkyl benzene sulfonate, *Cattle, *Detergents, Lauryl, *Mexico, Sulfonates, Water pol-

Household washing detergents are extensively used in Mexico and later appear in waste water, in which they are extremely persistent. The most common detergents are alkyl benzene sulfonates (ABS) and alkyl lauryl sulfonate (ALS). Data are presented showing the effects on blood, feces, urine and animal weight. No particular effects were noted.—Copyright 1973, Biological Ab-

PREDATION ON LARGEMOUTH BASS EMBRYOS BY THE POND SNAIL VIVIPARUS GEORGIANUS, Luther Coll., Decorah, Iowa. Dept. of Biology. J. W. Eckblad, and M. H. Shealy, Jr. Trans Am Fish Soc. Vol 101, No 4, p 734-738,

Identifiers: *Bass embryos, Largemouth bass, Micropterus-salmoides, Ponds, *Snail predation, Viviparus-georgianus, Spawning.

Predation by this snail may contribute to the high mortality of largemouth bass embryos (Micropterus salmoides) in bass spawning areas when this snail is abundant.--Copyright 1973, Biological Ab-W73-13603

PARASITE FAUNA OF DIFFERENT FORMS OF THE ARCTIC CHAR, SALVELINUS ALPINUS L., FROM KAMCHATKA, (IN RUSSIAN), Akademiya Nauk SSSR, Vladivostok. Institut

Morskogo Biologii. E. T. Makhovenko. Parazitologiya. Vol 6, No 4, p 369-375, 1972. En-

glish summary. Identifiers: *Arctic char, Ecological studies, *Fau-na parasite, Forms, *Kamchatka (USSR), Parasites, Salvelinus-alpinus, USSR.

Four freshwater forms and 1 anadromous form of Four treshwater forms and I anadromous form of the Arctic char were recorded from Lake Azabachye (Kamchatka) (USSR). The forms in-habit different ecological niches and differ in their parasite fauna. Certain parasites can be used as in-dicators of these forms. Further investigations in this field will provide an elaboration of a new method for differentiation of the Arctic char forms by means of parasite indicators.—Copyright 1973, Biological Abstracts, Inc.

MEASUREMENTS OF MICROALGAL PRIMA-RY PRODUCTION (PHYTOPLANKTON AND MICROBENTHOS) IN THE SMALANDSHAVET

(DENMARK), Spildevandsudvalget, Soborg (Denmark).

Dophelia. Vol 10, No 1, p 75-89, 1972. Illus. Identifiers: Algal, "Benthos, "Denmark (Smalandshavet), Measurement, "Phytoplankton, "Pri-

mary production, Waste waters, Dissolved ox-

Measurements of the production of organic matter by the microalgae (phytoplankton and microbenthos) have been carried out in the Smalandshavet-a shallow water area in the southern part of Denmark. Measurements of dissolved O2 and the vertical penetration of the green light were and the vertices personnel also made. The area investigated can be divided into 2 parts, and open area with a good exchange of water and an enclosed fjord with poor possibilities of water renewal. Both areas are recip loaded waste waters. None of the areas investigated had high microalgal production. The ineffective water exchange in the fjord makes the effective water exchange in the fjord makes the watermass very sensitive to larger amounts of O2-consuming substances. Because of outlet of sewage the concentration of dissolved O2 is low and the turbidity high. This restricts biological diversity. Calculations show that the O2 deficit observed is mainly due to loaded O2-consuming substances. The decomposition of in situ produced organic matter is of less importance.—Copyright 1973, Biological Abstracts, Inc. W73.13612. W73-13612

CHARACTERISTICS OF DIATOMS OF PRESENT-DAY GLACIAL LAKES OF THE POLAR URALS, For primary bibliographic entry see Field 02H. W73-13613

CHLOROPHYLL CONTENT AND PRIMARY PRODUCTION OF SESSILE ALGAL COMMU-NITY IN MOUNTAIN STREAM NITY IN MOUNTAIN STREAM CHIGONOZAWA RUNNING CLOSE TO KISO BIOLOGICAL STATION OF THE KYOTO UNIVERSITY,
Tokyo Univ. of Education (Japan). Dept. of

Botany. H. Kobayasi.

Mem Fac Sci Kvoto Univ Ser Biol, Vol 5 No 2, p 89-107, 1972. Illus.

Identifiers: Algae, Biological studies, Chigonozawa, *Chlorophyll, *Japan, Light, Mountain stream, Photosynthesis, *Primary production, Respiration, Running, *Sessile algae, Streams.

The chlorophyll standing crops and the photosynthesis-light intensity curves of the sessile algal communities, together with the light condition in the environments (measured with celestial photographs), were measured during 1964-1966 in the stream Chigonozawa (Japan), flowing in the montane region of central Japan. Algal communi-ties were mainly composed of blue-greens and diatoms. A linear correlation between light condi-tion and chlorophyll content was found. The annual mean value of chlorophyll content was 0.030 g/m2 and the annual gross production was esti gm2 and the annual gross production was esti-mated to be 0.13 kg. glucose/m2. Average annual values for the whole water course for total sum of the gross production, the amount of respiration and the net production were 86.45 kg. glucose, 53.68 kg. glucose and 32.78 kg. glucose, respectively. The photosynthesis-light intensity curve was a shade-type one with marked photo-inhibi tion both in summer and autumn (Ik was ca. 3200 lux).-Copyright 1973, Biological Abstracts, Inc. W73-13614

NATURE OF THE BOTTOM AND DISTRIBU-TION OF BENTHIC ORGANISMS IN THE BOL REGION (EASTERN ARCHIPELAGO OF LAKE

CHAD), Office de la Recherche Scientifique et Technique Outre-Mer, Fort-Lamy (Chad). For primary bibliographic entry see Field 02H.

PARASITES OF COMMON FISHES FROM PARASITES OF COMMON FISHES FROM
IRAQ WITH SPECIAL REFERENCE TO LARVAL FORM OF CONTRACAECUM (NEMATODA:HETEROCHEILIDAE),
Biological Research Centre, Baghdad (Iraq),
M. Shamsuddin, I. A. Nader, and M. J. Al-Azzawi.
Bull Biol Res Cent (Baghdad). No 5, p 66-78, 1971.

Identifiers: Barbus-esocinus, Contracaecum, Fish parasites, Gill, "Heterocheilidae, Ichthyopthirius-sp, "Iraq, Larva mugil-abu, "Nematoda, Parasites, Pathology, Piscicola-sp, Silurus-triostegus,

A total of 47 fishes belonging to 3 families, Cyprinidae, Siluridae and Mugilidae, were examined for various parasites. Protozoan parasites such as Ichthyopthiruis sp. were rarely found but Trichodina sp. was commonly recovered from all fishes. Protozoan blood parasites were not seen and the fishes were nearly negative for parasites of the groups Acanthocephala, Hirudinea and Crustacea. Two species of the genus Barbus, however, suffered heavy gill-infection with Piscicola sp. during late spring and summer only. Larval sp. during late spring and summer only. Larval cestodes were recovered only in 1 instance from B. esocinus and mature cestodes were obtained once from Silurus triostegus. In general, larval ne-matodes were found in most fishes but S. triostegus and Mugil abu suffered heavily. Notes on the larval nematodes, their seasonal variation, effects on fishes and biology and identification of Contracaecum are discussed.—Copyright 1973, Biological Abstracts, Inc. W73-13620

STUDY OF THE BIOLOGY OF PELOPIA PUNC-TIPENNIS MG. (CHIRONOMIDAE, DIPTERA) IN THE MINGECHAUR RESERVOIR (IN RUS-

nary bibliographic entry see Field 02H.

EXPERIMENTAL INFORMATION FOR SUB-EXPERIMENTAL INFORMATION FOR SUB-STANTIATING THE MAXIMAL PERMISSIBLE CONCENTRATION OF ISOPROPYLBENZOL HYDROGEN PEROXIDE IN BODIES OF WATER (IN RUSSIAN), Nauchno-Issledovatelskii Institut Gigieny,

Gigieny, For primary bibliographic entry see Field 05B. W73-13623 Moscow (USSR).

A NEW NEMATODE SPECIES IN CARP WATERS OF THE WEST REGIONS OF UKRAINE,

Zooveterynarnyi Instytut, Lvov (USSR). V. M. Ivasik, B. G. Svirepo, R. V. Skovronskii, and N. I. Vorona. Helminthologia (Bratisl). 10, p 181-183, 1969

Identifiers: *Carp, Cyclops-coronatus, *Ne-matode, Philometra-lusiana, Species, *Ukraine,

Philometra lusiana Vismans, which causes philometrosis in carp, was first observed in 1960 in Philometra Iusiana Vismans, which causes philometrosis in carp, was first observed in 1960 in Latvia, and in recent years has infected carp in the western regions of the Ukraine. Fish are affected in June, and the length of the life cycle is about I year. In order to study the biology of this parasite, helminth larvae obtained from female animals were incubated at 20 degrees with Cyclops coronatus, and were observed every 2-3 days. By the 6th day they became less mobile; on the 11th day 70% of the larvae died; and on the 14th day 100%. Research showed that fish were affected after eating an intermediary host (e.g., C. coronatus) infested with P. Iusiana larvae. Other intermediate hosts were found. Effective meacoronaus) intested with F. Iustana larvae. Other intermediate hosts were found. Effective mea-sures for combatting philometrosis in carp have not yet been developed.—Copyright 1973, Biologi-cal Abstracts, Inc.

Group 5C-Effects of Pollution

SANGUINICOLOSIS IN CARP IN THE

WINTER, Zooveterynarnyi Instytut, Lvov (USSR). V. M. Ivasik, and B. G. Svirepo. Helminthologia (Bratisl), 10, p 103-105, 1969

(19/1).
Identifiers: *Carp, Chilodonella-cyprini, Dactylogyrus-anchoratus, Dactylogyrus-extensus, Lymnaea, Myxobolus-dispar, Radix, *Sanguinicola-in-ermis, Sanguinicolosis, Trichodina-pediculus, USSR, Valvata, Winter.

The agent for sanguinicolosis in carp-Sanguinicola inermis Plehn, 1905, is encountered in many parts of the USSR, including the western remany parts of the USSK, including the western re-gions. The development of the parasite is complex, involving molluscs (Lymnaea, Radix, Valvata) as an intermediate host. Outbreaks of sanguinicolosis were observed most frequently in June, July, and less frequently in August. The parasite produces eggs from May-Nov. The number of adult parasites in gills of 1 fish was 3-120; in the heart, 1parasites in gills of 1 fish was 3-120; in the heart, 1-10. Observations made in Feb., 1965 revealed that fish were infested to some extent by the following parasites: Myxobolus dispar, Trichodina pediculus, Chilodonella cyprini, Dactylogyrus anchoratus, Dactylogyrus extensus. During sanguinicolosis, Hb was reduced by 20% in mild cases and 61% in serious cases. In mild cases serum reception of the property of t and of 76 in sections cases. In finite dasses setum protein was 69.6% lower; albumin and beta-globulin decreased. In serious cases, alpha-globulin increased. In the winter period, sanguinicolosis in carp lead to significant physiological changes. In order to combat this disease, the cycle of parasite development must be broken by eliminating the mollusc intermediate host and also by periodic summering in streams.—Copyright 1973, Biological Abstracts, Inc. W73-13625

NATURAL TULAREMIA FOCI STRUCTURE IN THE FLOODLANDS OF SMALL AND MEDIUM RIVERS. II. EPIZOOTOLOGIC NATURE OF ELEMENTARY FOCI (IN RUSSIAN),

V. L. Adamovich.
Zh Mikrobiol Epidemiol Immunobiol, Vol 48, No. 24 Mikrobiol Epidemoi immunobiol, voi 48, No 10, p 108-13, 1971, Illus, English summary. Identifiers: Arvicola-terrestris, *Epizootologic studies, *Floodlands, Insects, Rivers, *Tularemia foci, *Diesna River (USSR).

Elementary tularemia foci localized in terraces over the flood-lands of Diesna river resemble the forest, premountain-spring and forest-swamp foci.
Riocenoses of the meadow flood-land convert the splashes of the infection from the elementary foci into a flood-land focus. The name valley-river focus is suggested for a flood-land focus on Diesna; epizootologic significance of such focus is associated not with the population of Arvicola ter-restris L. and water regimen, as large rivers, but is determined by complicated processes of fluctua-tion of the infection on the terrace slopes. Epidemiologic prognosis should proceed not from the population of A. terrestris L., but from the the population of A. terrestris L., but from the general epizootic situation in the river valley, intensity of flight of blood-sucking insects and immunity in the human population.—Copyright 1973, Biological Abstracts, Inc.

MATERIALS FOR HYGIENIC ASSESSMENT OF SALT COMPOSITION IN DRINKING WATER: VI. EFFECT OF CONSUMPTION OF MAGNESIUM SALTS WITH DRINKING WATER ON OSSIFICATION PROCESSES IN GROWING ANIMALS, Vsesoyuznyi Nauchno-Issledovatelskii Institut

Zheleznodorozhnoi Gigieny, Moscow (USSR).

I. S. Kandror, K. G. Basmadhzieva-Tancheva, and

J Hyg Epidemiol Microbiol Immunol (Prague), Vol

15, No 4, p 462-468, 1971.

Identifiers: Hygienic studies, *Magnesium salts, *Ossification, Osteoporosis, Rats, *Salt, X-Ray,

Experiments were performed on white rats of the Wistar line which consumed drinking water with Mg salt concentration of 100 and 500 mg/l. The content of Mg in the bone ashes increased 2-4 times as compared with the control animals (10 mg/l) at a certain decrease of Ca content. At a concentration of 500 mg/l, the Ca content in bone ashes decreased to 1/3. X-ray examination of tubuashes decreased to 1/3. X-ray examination of tubu-lar bones demonstrated moderate osteoporosis of Ca deficiency type in the metaphyses. Drinking water containing Mg salts in excess (100 and 500 mg/l) may compensate lack of Mg in food products. In general, an excess of Mg salts in the ration did not necessarily cause all excessive Mg to be eliminated from the organism. A part of it was deposited in the bone tissue replacing Ca in hydroxyapatite crystals and led to the manifestahydroxyapatite crystals and let to the maintenan-tions of osteoporosis. The data yield a basis for the determination of the norm of Mg salt content in drinking waters in the international standard of determination of the norm of Mg sair content of md and content of md and content of drinking water quality.—Copyright 1973, Biological Abstracts, Inc. W73-13630

INTESTINAL INFECTION CARRIER SURVEY IN DIYARBAKIR: I. (IN TURKISH), C. Yumul, and O. Gulesen.

Mikrobiyol Bul, Vol 6, No 2, p 199-204, 1972, En-

gush summary. Identifiers: Escherichia-coli, Human infection, *Intestinal infection, Klebsiella, Salmonella, Shigella, Survey, *Turkey (Diyarbakir), Vibriocholerae, *Bacteria.

There was an increase in the rate of intestinal infections, in Diyarbakir, Turkey, during the autu months of 1971. A carrier survey was made. Samples of feces were taken from 273 soldiers of the regional gendarmerie unit. Four carriers (2 Shigella and 2 Salmonella) were found and treated. ehere was no Vibrio cholerae carrier. The gendarmerie was no Vibrio cholerae carrier. The gendarmerie unit was quartered near a spring, and the water from the spring was used. Samples of spring water were examined bacteriologically. Escherichia coli and Klebsiella were found in the water samples. Advice was given to chlorinate the water. In organized communities, there might be intestinal infection carriers in significant numbers.—Copyright 1973, Biological Abstracts, Inc. W73-13631

STUDY OF PARASITES IN FISHES OF THE SIND RIVER: L. TREMATODES OF HILSA

ILISHA (HAM.), Government Coll., Tando Muhammad Khan (Pakistan) S S H Rizvi

Sind Univ Res J Sci Ser, Vol 5, No 2, p 189-200, 1971 Illus

Identifiers: Aphanurus-monolecithus, Faustulahilsai, *Fish parasites, *Hilsa-ilisha, Lecithaster-indicus, *Pakistan (Sind River), Parasites, Rivers, Species, *Trematodes.

Hilsa ilisha, a food fish of Sind (Pakistan), was exrinsa ilisna, a rood rish of sind (Pakstan), was ex-amined. Three species of trematodes, 4 of cestodes and 1 of Acanthocephala were found to infect the host. The trematode species Aphanurus monolecithus and Lecithaster indicus are redescribed. Faustula hilisai is described and figured.--Copyright 1973, Biological Abstracts,

5D. Waste Treatment Processes

W73-13634

COST OF WASTE WATER POLLUTION ABATEMENT IN POULTRY PROCESSING AND RENDERING PLANTS IN GEORGIA, Georgia Univ. Athens. Dept. of Agricultural W. R. Kerns, and F. J. Holemo

Available from the National Technical Informa-Available from the National Technical Informa-tion Service as PB-222 506, \$3.00 in paper copy, \$1.45 in microfiche. Environmental Resources Center, Georgia Institute of Technology. Atlanta, Report ERC-0673, June, 1973. 39 p., 18 tab, 11 ref. OWRR A-038-GA (1). 14-31-0001-3810.

Descriptors: Water pollution control, *Poultry, *Industrial wastes, Economic impacts, Environ-mental effects, Waste disposal, Food processing industry, *Georgia, *Treatment facilities, *Waste treatment. Waste water treatment. Identifiers: *Poultry processing wastes, Rendering

Information on pollution control practices was obtained from 26 poultry processing plants and nine by-products plants in Georgia. Data were obtained by-products plants in Georgia. Data were obtained on plant size and type of operation, approaches to waste treatment, expenditures, degree of environ-mental control achieved, and the disposition of byproducts. Each plant can balance the cost of process changes to reduce waste generation with the cost of waste treatment. Plants with access to a public sewerage service can balance sewer public sewerage service can balance sewer changes against their other costs. The industry is making substantial expenditure of all three kinds. Processing plants are spending an average of \$10,800 annually for waste reduction and waste \$10,800 annually for waste reduction and waste treatment equipment, an amount equal to \$0.88 per 1,000 birds processed. Average annual operation and maintenance expenses (for both types of equipment plus service charges) are \$16,900 per plant and \$1.35 per 1,000 birds processed. Estimate the service of sufficient the sufficient the service of sufficient the service of sufficient the service of sufficient the service of sufficient the service of sufficient the service of sufficient the service of sufficient mates were also made of the cost of utilizing the best available control technology. For plants employing their own treatment systems, it was esti-mated that annual equipment expenditures would increase by a factor of 3.2 and that operation and maintenance expenditures would increase by a factor of 5.8. The initial expenditure for new equipment could run as high as \$23 per 1,000 birds equipment could run as nigh as \$25 per 1,000 birds processed. Public service charges could triple cur-rent rates. Most plants indicated that current treat-ment expenses have had little effect on product prices and profits; however, both may be affected as higher water quality standards require more advanced pollution control technology. (James-Georgia) W73-13003

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STUDY OF GAMMA INDUCED LOW TEM-PERATURE OXIDATION OF TEXTILE EF-FLUEHNTS.

National Lab., Tenn. Isotopes Oak Ridge elopment Center.

Development Center.
F. N. Case, and E. E. Ketchen.
Copy available from GPO Sup Doc as
EP1.23/2:73-260, \$0.90; microfiche from NTIS as PB-222 621, \$1.45. Environmental Protection Agency, Technology Series Report EPA-R2-73-260, May 1973. 60 p. 9 fig, 27 tab, 6 ref. EPA Pro-ject 12090 FWD.

Descriptors: Color, *Oxidation, *Chemical oxygen demand, *Gamma rays, Radiation, *Pulp wastes, Dyes, *Waste water treatment. Identifiers: *Color removal, Textile effluents, *Charcoal reactivation

Gamma irradiation of textile mill effluents under oxygen pressures up to 1500 psi, with and without activated charcoal present, was studied as a method for removing color and removal of sub-stances contributing to the chemical oxygen de-mand (COD). Both color and COD reduction are directly related to the radiation dose and pressure directly related to the radiation dose and pressure of the oxygen over the dye solution samples during irradiation. Color removal was achieved in solutions of dye prepared in the laboratory for process evaluation and for authentic textile mill waste effluents; however, the variation in the radiation dose required for various dye compounds was large. The study revealed a new method for in-situ reactivation of charcoal by gamma-radiation-induced oxidation of organic compounds adsorbed

Waste Treatment Processes—Group 5D

on charcoal. This discovery permits a large reducon charcoal. This discovery permits a large reduc-tion in the gamma source size required for processing textile mill effluents because the water fraction of the effluent does not need to be irfraction of the effluent does not need to be ir-radiated to the same degree as the organic material contained in the effluent. A mathematical model for the process, developed late in this study, has not yet been experimentally verified. (EPA) W73-13022

UPTAKE OF MERCURY BY YEAST CELLS.

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Cornell Univ., Ithaca, N.Y.
A. Ramalingam.
M Sc Thesis, January 1973. 59 p, 17 fig, 13 tab, 15 ref. OWRR-A-039-NY (2).

Descriptors: *Mercury, *Waste water treatment, *Yeasts, *Biological treatment, *Water pollution treatment, Water pollution control, Water treatment, Sorption, Magnesium, Iron, Operating

Mercury uptake by yeast cells depleted in mag-nesium and/or iron was studied with a view to developing a biosorption process for removal of mercury. Mercury uptake was highly variable and no clear trend was observed with different media. Yeast absorbed mercury up to 1% of the dry cell weight. The mercury content of the cells increase as the mercury content of the contacting solution dropped from 20 ppm to 1 ppm. The fact that only a part of the mercury was reversibly bound sug-gests that more than one binding mechanism is gests that more than one binding mechanism is operating. About 11.55 gm of yeast per liter of waste was necessary for reducing the mercury level from 60 ppm to 7 ppm. It is suggested that the process be combined with another treatment, for example, ion exchange, for economic operation. The operating costs would be rather high, amounting to about \$20.00 per 1000 gallons for a plant to treat 15,000 gallons per day. (Knapp-USGS) W73-13030

SECONDARY SEWAGE TREATMENT IN PIPELINE CONTACTORS, Delaware Univ., Newark. Dept. of Chemical En-

T. W. F. Russell. an Journal of Chemical Engineering, Vol 50, p. 179-184. April 1972. OWRR-A-008-DEL (3).

Descriptors: *Sewage treatment, Pipelines, *Oxygenation, Mathematical models, *Waste water treatment, *Sewage, Design, Tubes.

The preliminary design steps for a secondary sewage treatment process are discussed in a case study format. A tubular contactor with an oxygenator and reactor section is proposed as an al-ternate design to the conventional open tank W73-13077

FEASIBILITY OF USING PULP MILL SLUDGE AS AN ADDITIVE TO CORRUGATING MEDI-UM,

Washington Univ., Seattle. Coll. of Forest Resources. For primary bibliographic entry see Field 05E. W73-13081

NITRIFICATION AND DENITRIFICATION - A SELECTED BIBLIOGRAPHY, North Carolina Univ., Chapel Hill. Dept. of Environmental Sciences and Engineering. For primary bibliographic entry see Field 05B. W73-13085

ACTIVATED SLUDGE MODIFICATIONS FOR ENHANCEMENT OF TRICKLING FILTER PLANT PERFORMANCE. I. DESIGN, OPERA-

TION, AND BOD REMOVAL IN THE UNITS. II. NITRIFICATION, North Carolina Univ., Chapel Hill. Dept. of Environmental Sciences and Engineering. D. E. Francisco, L. W. Little, and J. C. Lamb, III. UNC Wastewater Research Center Report No 18, April 1971. 43 p, 10 fig, 6 tab, 24 ref. EPA Project 11010 DGA. 14-12-505.

Descriptors: *Waste water treatment, *Treatment facilities, *Trickling filters, Filtration, Design, Operations, *Activated sludge, *Nitrification, *Biochemical oxygen demand.

Enhancement of trickling filter plant performance by subsequent activated sludge treatment was in-vestigated. Five activated sludge pilot plants, each consisting of aeration tank and settling tank with air lift sludge return, were fed trickling filter ef-fluent at a constant rate (300 ml/min). Hydraulic detention times in the aeration units were 0.4, 1.7, 4.0 and 9.2 hrs. Temperature was maintained at 25C. Effects of pH control, sludge wasting, and detention time were evaluated. Results indicated that activated sludge treatment substantially in-creased overall BOD, COD, organic carbon, and MBAS removals. At detention times of at least 1 ificant nitrification was achieved. Control of pH with NaHCO3 improved nitrification effincy; however, substantial nitrification was hieved at pH levels below 7. Control of wasting and of return sludge was necessary for optimum BOD, COD, and organic carbon removals and for optimum nitrification. W73-1308

VARIATIONS IN CHARACTERISTICS OF WASTEWATER INFLUENT AT THE MASON WASTEWATER INFLUENT AT THE MASON FARM WASTEWATER TREATMENT PLANT, CHAPEL HILL, NORTH CAROLINA, North Carolina Univ., Chapel Hill. Dept. of Environmental Sciences and Engineering. R. L. Hanson, W. C. Walker, and J. C. Brown. UNC Wastewater Research Center Report No 13, December 1970. 47 p. 7 fig. 23 tab, 12 ref. EPA Project 11010 DGA. 14-12-505.

Descriptors: Waste water treatment, "Treatment facilities, "Waste identification, "North Carolina, "Domestic wastes, Waste water (Pollution), "Organic loading. Identifiers: *Chapel Hill (N.C.).

Variations in characteristics of wastewater from the Town of Chapel Hill (N.C.) were studied. Composite samples of domestic wastewater in-fluent were collected at 2-hr intervals over 24-hr periods on each of the seven days of the week so that diurnal variations in flow and constituent concentrations and loadings could be observed. Samples were analyzed for BOD, COD, TOC, nitrogen, phosphorus, MBAS, and specific solids and metal constituents. Influent flow was found to vary from 30 to 144% of average with the max-imum flow occuring between 1000-1200 hours and the minimum flow between 0400-0600 hours Wastewater constituents showed a wide range of concentrations and loadings. Generally maximum concentrations and loadings occurred between 1000-1400 hours and the minimum values between 0600-0800 hours. The ratio of maximum to num concentrations for the constitu varied from 4-12 to one; for loadings, from 10-20 to one. (Little-North Carolina) W73-13087

NITROGEN BALANCE IN SOIL COLUMNS IN-THATCHEN BALANCE IN SOIL COLUMNS INTERMITTENTLY FLOODED WITH SECONDARY SEWAGE EFFLUENT,
Agricultural Research Service, Phoenix, Ariz.
Water Conservation Lab.
For primary bibliographic entry see Field 05B.
W73-13116

DESIGN PROCESS MANUAL. PHOSPHORUS REMOVAL, Black and Veatch Kansas City Mo.

Available from the Environmental Protection Agency, Office of Water Programs, Technology Transfer, Washington, D.C., in microfiche from NTIS on PB-214 553 for \$51.45. Environmental Pro-tection Agency, Technology Transfer Manual, Oc-tober 1971, 195 p. EPA Project 17010 GNP, Con-tract 14-12-936.

Descriptors: Phosphorus, *Chemical precipita-tion, Eutrophication, *Coagulation, *Flocculation, *Settling basins, *Filtration, *Mixing, Dewatering, Sludge treatment, Solids contact process, Tertiary treatment, Municipal wastes, *Waste water treat-

ment. Identifiers: *Phosphorus removal, Alum, Ferrous, Ferric, Lime treatment, Sodium aluminate, Pickle liquor, Dual media, Multimedia, Thickening.

The discharge of phosphorus-containing waste-waters into the surface waters of the United States has contributed to their over-fertilization and eutrophication. As a result, efforts are now being eutrophication. As a result, efforts are now being made to remove phosphorus from wastewater. This manual discusses phosphorus removal methods that have been found effective and practical for use at treatment plants. All the methods included involve chemical precipitation of the phosphorus and removal of the resultant precipitate. Precipitants include salts of aluminum and iron, and lime. The practical points of addition are before the primary settler, in the aerator of an are before the primary settler, in the aerator of an activated sludge plant, before the final settler, or in a tertiary process. Included in the discussion of each treatment method is a description of the each treatment method is a description of the method, pilot or full-scale performance data, equipment requirements, design parameters, and costs. This information should be of value to designers, municipal officials, regulatory agencies, city planners, and treatment plant operators.

(Brunner-EPA) W73-13129

PROCESS DESIGN MANUAL FOR SUSPENDED SOLIDS REMOVAL.
Burns and Roe, Inc., Oradell, N.J.

Available from Technology Transfer, appropriate E.P.A. Regional Office; in microfiche from NTIS as PB-214 551 for \$1.45. Environmental Protection Agency, Technology Transfer Manual, October 1971, 149 p. EPA Project 17030 GNO, Contract 14-

Descriptors: *Waste water treatment, *Treatment Descriptors. Waste water treatment, Treatment facilities, Tertiary treatment, Chemical precipitation, Coagulation, Diatomaceous earth, Filtration, Flocculation, Flotation, Membrane processes, Settling basins, Solids contact process. Identifiers: *Design considerations, *Operation requirements, *Cost estimates, Chemical feeding, High-rate settlers, Microscreening.

This manual comprises a compilation of informa-tion on the practice of suspended solids removal from municipal wastewaters. General engineering considerations are cited with respect to their im-pact on the design of treatment facilities. Specific processes utilized for suspended solids removal are described, discussed and illustrated through the use of data from installations which have em-loyed these processes. Current technology and ployed these processes. Current technology and advanced methods of treatment are stressed in order to provide usable information for implemenorder to provide usable information for implemen-tation in design of new treatment facilities. Some aspects of the operation and maintenance require-ments of the described unit processes are delineated, along with the overall estimated costs of construction and operation. The information and data provided are presented in such a manner that they can be readily incorporated into practice. (Kreissi-EPA)

Group 5D—Waste Treatment Processes

PROCESS DESIGN MANUAL FOR CARBON ADSORPTION. CH2M/Hill, Corvallis, Oreg.

Available from Environmental Protection Agency, Regional Offices, Technology Transfer; in microfiche from NTIS as PB-214 552 for \$1.45. Environmental Protection Agency, Technology Transfer Manual, October 1973, 195 p. EPA Pro-ject 17020 GNR.

Descriptors: *Waste water treatment, *Treatment facilities, *Activated carbon, Adsorption, Biodegradation, Dewatering, Filtration, Tertiary treatment.

Identifiers: *Carbon regeneration, *Design parameters, Cost estimates, Operation require-ments, Organic removal, Physical-chemical treat-*Design ment

Activated carbon adsorbs a great variety of dis-solved organic materials found in wastewater, in-cluding many which are resistant to biodegrada-tion in conventional biological wastewater treat-ment plants. Carbon's great efficiency in organic removal has promoted its use for upgrading con-ventional plant performance. Successful use of ventional plant performance. Successful use of carbon in tertiary treatment has led to proposals that it be used for secondary treatment as well, i.e., as a replacement for biological treatment. In i.e., as a replacement for onlogical treatment. In the latter instance, activated carbon would be used as one portion of a larger physical-chemical treatment plant. This manual, a revision of the 1971 manual by Swindell-Dressler Co., Pittsburgh, Penn., examines major design parameters and unit operations, (including retreatment) which are inconstituted. operations (including pretreatment) which are important in carbon adsorption systems. Existing portant in carbon adsorption systems. Existing carbon plant designs are evaluated. Costs are evaluated for the various unit operations. Various plant configurations are discussed. Carbon regeneration (a prerequisite for economic feasibility) is discussed and the necessary equipment is described. Other aspects discussed include: air pollution control devices for the regeneration furnace, personnel requirements, isotherm and pilot testing, carbon dewatering, biodegradation of organics in carbon columns. (EPA)

PROCESS DESIGN MANUAL FOR UPGRAD-ING EXISTING WASTEWATER TREATMENT PLANTS.

Weston (Roy F.), Inc., West Chester, Pa.

Available from: EPA Regional Office Technology Avanator from: FA Regional Office Technology Transfer; in microfiche from NTIS as PB-214 550 for \$1.45. Environmental Protection Agency, Technology Transfer Manual, October 1971, 275p. EPA Project 17090 GNQ, Contract 14-12-933.

Descriptors: *Waste water treatment, Optimiza-tion, *Treatment facilities, *Sewage treatment, tion, "Treatment facilities, "Sewage treatment, "Biological treatment, "Performance, "Control systems, Activated sludge, Aeration, Associated costs, Centrifugation, Chemical precipitation, Design criteria, Disinfection, Filtration, Floccula-tions, Lagoons, Monitoring, Odor, Operation and maintenance, Organic loading, Oxygen require-ments, Sampling, Separation techniques, Sludge digestion, Sludge treatment, Trickling filters, Water quality.

ments, Samping, Separation digestion, Sludge treatment, Trickling filters, Water quality. Identifiers: Chemical treatment, Physical treatment, Recirculation, Effluent polishing, Clarifiers, Contact stabilization, Step aerations, Oxygen

The main purposes of this manual are to examine situations that necessitate upgrading of existing municipal wastewater treatment plants and to discuss and evaluate the corrective actions that are required to upgrade these existing plants. Upgrad-ing to overcome organic and hydraulic overloadings and/or to meet more stringent treatment requirements is considered. The information presented is specifically adapted to plants having capacities of less than 5 mgd. This particular capacity was selected because most of the existing

municipal wastewater treatment plants in the United States have capacities of less than 5 mgd. The manual emphasizes that operational improvement and modifications to existing unit operations to considered as the logical initial approach to upgrading existing treatment plants, before major expansion of existing facilities is implemented. Because of the numerous alternatives available for upgrading an existing treatment plant, it is necessary to understand thoroughly the fundamentals of the various unit operations commonly used in municipal wastewater treatment plants. Therefore, this manual examines in depth the capabilities, limitations, and interrelationships of the various unit processes. The manual also examines hypothetical situations requiring upgrading of unit operations. One chapter of the manual presents case histories of upgrading of existing wastewater treatment plants to illustrate the approaches actually used in these circumstances. The operation and maintenance requirements of the upgraded treatment plants are also briefly examined in the manual. (EPA) ual. (EPA) W73-13132

RELIABILITY: A NEW PARAMETER IN URBAN WATER QUALITY MANAGEMENT, Texas A and M Univ., College Station. Dept. of Industrial Engineering. dustrial Engineering. C. S. Shih, and J. K. Garner.

C. S. Shih, and J. K. Garner. In: Proceedings (Vol. II), International Symposi-um on Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tuc-son, December 11-14, 1972, p 801-830, (1972). 4 fig, 3 tab, 17 ref.

Descriptors: "Reliability, "Municipal water, River basins, Water quality control, "Optimization, "Management, Treatment facilities, Water pollution control, Environmental effects, Probability, Mathematical models, Systems analysis, Costs, "Regional analysis, Waste water treatment, "Texas, "Risks. Identifiers: *San Antonio (Tex), Sensitivity analy-

The endeavor to reduce the liability of pollution to the endeavor to reduce the hability of pollution to urban water resources necessitates recognition of the probabilistic nature of the performance of pol-lution control facilities as well as environmental responses. There exists a great need to devise a methodology for the assessment of uncertainty of goal achievement and control parameters variation for river basin quality management. Reliability is defined herein as the measure of effectiveness for the attainment of water quality managerial goals. The concept of reliability of regional waste facilities is introduced. An optimization model is developed for the determination of the best pollution control policies for each treatment facility in terms of the minimization of total regional co requirements, the quality control requirements, and the reliability desired. The variability of each treatment facility is characterized by a normally distributed random variable whereas the quality distributed random variable whereas the quality standard and reliability requirement is represented by a chance-constraint. Using the newly developed chance-constrained quadratic programming method coupled with parametric analysis, a solution approach for the model is devised. The effects of reliability on optimum managerial policies of urban water quality are illustrated by applying the developed model to the existing situation of San Antonio Area, Texas. Implications resulting from the sensitivity analysis of this model are also discussed. (See also W73-13134) (Bell-Cornell) W73-13156 W73-13156

INORGANIC NITROGEN REMOVAL FROM WASTEWATER: EFFECT ON PHYTOPLANK-TON GROWTH IN COASTAL MARINE WATERS, Woods Hole Oceanographic Institution, Mass.

For primary bibliographic entry see Field 05C. W73-13179

SURVIVAL OF SALMONELLA TYPHIMURIUM IN ANIMAL MANURE DISPOSAL IN A MODEL OXIDATION DITCH, Minnesota Univ., St. Paul. Coll. of Veterinary Medicine.

For primary bibliographic entry see Field 05C. W73-13253

EFFECT OF WASTE WATER FROM THE ASTRAKHAN CELLULOSE-PASTEBOARD PLANT ON SOIL PROPERTIES, V. S. Shumakov, and M. P. Popova.

Soviet Soil Science, Vol 4, No 5, p 577-587, 1972. 2 fig, 12 tab, 14 ref. Translated from Pochvovedeniye, No 10, p 99-109, 1972.

Descriptors: Waste water treatment, "Water reuse, "Industrial water, "Waste water disposal, "Irrigation effects, "Desalination, Irrigation, "Irrigation water, Irrigation ditches, Soil properties, Laboratory tests, Trees, Crop production, Soil types, Saline soils, Alkaline soils, Brown soils, Semiarid climates. Identifiers: *USSR (Astrakhan), Poplar trees,

Since waste water from cellulose-pasteboard plants cannot be discharged into natural bodies of water without preliminary treatment, the inter-mediate use of industrial waste water to irrigate mediate use of mustrial waste water to irrigate various crops, as an additional resource, was stu-died. Field and simulated laboratory experiments were conducted using a mixture of industrial waste water from the Astrakhan Cellulose-Pasteboard Plant and domestic (Volga) water to irrigate poplar stands on Brown Desert-Steppe soils. During the stands on Brown Desert-Steppe soils. During the first few years such use resulted in partial desalinization of the saline soils, but desalinization occurred more slowly than when the same soils were irrigated with Volga water. After irrigation with domestic-industrial waste water, desalinizawith domestic-industrial waste water, desanniza-tion of Brown Desert-Steppe soils of different tex-tures resulted in a 33 to 92 percent increase in total alkalinity and a 5 to 16 percent increase in the degree of solonetzicity of the soils. The rate of solonetzization varied with soil texture, irrigation rate, and intake rate of irrigation water. Solonet-instead in the purpose of the irrigation water. zization in the surface layers of the irrigation furrows caused a sharp decrease in permeability. To improve the intake of irrigation water by poplars and to diminish the effects of solonetzization, temporary, rather than permanent, irrigation ditches or furrows should be used for a single growing season. (Gloyd-Arizona) W73-13315

SOLID WASTE DISPOSAL AND WATER PURIFICATION METHOD AND APPARATUS, Combustion Power Co., Inc., Palo Alto, Calif. (As-

signee).
R. D. Smith, and D. A. Furlong.
U. S. Patent No 3,741,890, 9 p. 9 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 911, No 4, p 1419, June 26, 1973.

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Descriptors: *Patents, *Waste treatment, *Waste Descriptors: "Patents, "Waste treatment, "Waste water treatment, Pollution abatement, Waster quality control, Phosphates, Nitrogen, Lime, Suspended solids, Colloids, "Distillation, "Nutrient removal, "Domestic wastes, "Industrial wastes, Waste disposal Identifiers: Char, Combustion, Compression, Clarification, Sterilization, Pyrolysis.

The energy to operate this system is derived from the solid waste itself, the active char by-product of the pyrolysis of the waste being utilized to adsor contaminants from the waste water. Solid waste material is shredded and dried and then transferred to the pyrolyzer where waste is converted to hot fuel gas and char. The hot fuel gas is used to drive a gas turbine which generates all the power

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necessary to operate the system. Heat obtained from exhaust of the turbine assembly is used in drying the incoming waste material, and a com-pressor driving by the turbine supplies compressed air to a char combustion chamber. A portion of the pressor driving by the turbine supplies compressed air to a char combustion chamber. A portion of the char is removed from the pyrolyzer and mixed with incoming waste water to remove contaminants therefrom by adsorption. After adsorption of the contaminants, a portion of the char is removed from the water and recirculated back in the pyrolyzer. Water partially decontaminated through adsorption by char; is clarified with lime taken from ash generated in the combustion of the very same char. Lime clarification serves to remove from the water the supra-collodial and colvery same char. Lime clarification serves to remove from the water the supra-collodial and colloidal suspended solids, the colloidal size char particles and the phosphates. Calcium carbonate precipitated during clarification can then be returned to the pyrolizer. Heat and power generated in the system can be used to distill and sterilize the partially treated waste water to make it potable. (Sinha-OEIS) W73-13320

SCREENING AND AERATING CONCENTRA-

Sweco, Inc., Los Angeles, Calif. (Assignee).

Sweed, Inc., Los Angeles, Carlotte, R.P. Miller, Jr.
U.S. Patent No. 3,739,912, 4 p, 3 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 911, No 3, p 903, June 19, 1973.

Descriptors: *Patents, *Aerobic treatment, Screens, *Flotation, *Sewage treatment, *Waste water treatment, Pollution abatement, *Dissolved oxygen, Treatment, Equipment, *Aeration, Storm water, Water pollution control, Water quality control.

One or more high-rate rotating screen concentra-tors are described wherein the influent is fed to the interior of a generally cylindrical, rapidly rotating screen. The concentrator is constructed to permit dispersion and atomization of effluent for increasdispersion and atomization of effluent for increas-ing exposed fluid surface area and for improved contact with air to increase the dissolved and/or entrained oxygen. The dissolved oxygen aids aero-bic digestion and the entrained oxygen aids in frothing for flotation and separation of fine solids and oil. Material which does not go through the screen may be piped to a treatment facility. (Sinha-OFIS) W73-13321

AERATORS,

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Simon-Hartley Ltd., Stoke-on-Trent (England). W. S. Robertson

U.S. Patent No. 3,741,682, 3 p, 3 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 911, No 4, p 1374, June 26, 1973.

Descriptors: "Patents, "Activated sludge, "Aera-tion, "Waste water treatment, Equipment, Pollu-tion abatement, Oxygenation, Water pollution control, Water quality control.

The aerator comprises a support adapted to be rotated about its central vertical axis. Angularly spaced blades are secured to be underside of the support. Each blade has a plate secured to its lower edge and extending on both sides of the blade along at least a part of the length of the blade from its outer end towards the center of the aerafrom its other ent towards the center of the aeria-tor. This aerator is adapted to be rotated in the sur-face of a liquid to be agitated and aerated. The liquid is thrown out by centrifugal action through the U-shaped duct defined on the leading side of the U-snaped duct defined on the feature of rota-tion. Air is drawn down the U-shaped duct on the trailing side of each blade with respect to the direction of rotation. The air is drawn down into the region of maximum turbulence and ensures a good supply of oxygen to the liquid being aerated. (Sinha-OEIS)

PERFORATED TUBE MODULE FOR LIQUID

TREATMENT, Neptune Microfloc, Inc., Corvallis, Oreg. (as-

signee)
A. K. Hsiung.
U.S. Patent No. 3, 741,401, 4 p, 7 fig, 4 ref; Official Gazette of the United States Patent Office, Vol911, No 4, 1303, June 26, 1973.

Descriptors: *Patents, Separation techniques, *Waste water treatment, Equipment, *Liquid wastes, Pollution abatement, Water quality control, Water pollution control. Identifiers: Kinetic energy.

The apparatus comprises a set of inclined channels selected from perforated partitions or walls. The kinetic energy of an influent liquid is rapidly dissipated as the liquid flows through the perforations while the solids suspended in it settle out on the inclined bottoms of the channels. The liquid flowing through the device flows upward through the settling compartments as well as sequentially from the first to the last, while particles settle out and slide downward to the bottom into a sludge collecting and withdrawing device. (Sinha-OEIS)

WATER PURIFYING APPARATUS,

U.S. Patent No. 3,741,396, 2 p, 5 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 911, No 4, p 1301, June 26, 1973.

Descriptors: *Patents, Filters, *Filtration, *Water purification, *Water quality control, *Waste water treatment.

The body of the apparatus has a main inlet port and a main discharge port, with corresponding secondary ports and control valves. A filter tank is mounted on the body. It contains a pair of hollow cylindrical filter elements, each having a wall defining a filter through which fluid may pass. The valves may be manually controlled to direct the untreated water either through the filter elements into the discharge ports or directly to the discharge port. (Sinha-OEIS) W73-13326

LIQUID FILTERING APPARATUS, L. F. Defenbaugh. U.S. Patent No. 3,741,394, 3 p., 2 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 911, No.4, p 1301, June 26, 1973.

Descriptors: *Patents, *Water purification, Fil-ters, *Filtration, Activated carbon, Water quality control, Equipment, *Waste water treatment.

Apparatus comprises a housing which includes means for inserting the apparatus in the water line. It has removable cartridges containing suitable filtering materials such as activated carbon particles. A three-way diverter valve is operable to divert water flow through the filtering material or straight through the apparatus bypassing the filtering material. A metering valve is used to control the back pressure within the unit in order to maximize contact between the fluid and the filtering material. (Sinha-OEIS)
W73-13327 W73-13327

APPARATUS FOR THE PURIFICATION OF

WASTE WATER, Corodex (N.V.), Zandvoort (Netherlands). (asignee)

U.S. Patent, No. 3,741,392, 4 p, 1 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 911, No 4, p 1300, June 26, 1973.

Descriptors: *Patents, *Chemical reactions, *Waste water treatment, Phenols, Resins, Pollu-tion abatement, *Water purification, Water pollu-tion control, Water quality control.

Identifiers: Formaldehyde.

The apparatus includes a mixing tank with lines to feed it with contaminated water, acid and phenol. The tank discharges to a heatable reservoir which has a gravity drain to a settling tank as well as an off-take for gaseous products and a bleed-off line from an intermediate zone for conveying fluids to an overflow tank. The overflow tank has a return line to the reservoir and a gravity drain for liquid an overflow tank. The overflow tank has a return line to the reservoir and a gravity drain for liquid resin. It is connected to an expansion boiler which is heated by fluid from heat exchange units. A stack removes vapor upward. A bleed-off line to an acid recovery vessel may be added. Air injectors are used as needed to maintain circulation. One or more phenols and an acidic reagent is added to the water to be purified. The phenol-formaldehyde molar ratio is important. The molar ratio in the waste water is generally 1:4.18 that is the percentage of formaldehyde is too high. By adding phenol the molar ratio is brought to 1:1.02 to 1:1.12. The formaldehyde will be bound by the phenol, as a result of which a thin, liquid resin mixture will be separated, while large resin molecules (i.e. -viscous resin) are avoided. (Sinha-OEIS) OFIS) W73-13328

TERTIARY FILTER,
Harsco Corp., Wormleysburg, Pa. (assignee)
G. L. Wallace, T. A. Ward, and P. R. Johnson.
U.S. Patent No. 3,741,390, 7 p, 12 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 911, No 4, p 1300, June 26, 1973. "Patents," Tertiary treatment, "Waste water treatment, "Liquid wastes, "Filtration, "Pollution abatement, Water pollution control, Water quality control.

controlled backwash cycle. In the backwash cyc pressurized air is forced through the clogged filter media. This assures proper bed expansion and uniform agitation, prior to circulating wash water to flush solids out of the media. The contaminated to train sounds out of the media. The contaminated backwash water may then be delivered to a previous stage of the sewage treatment system for further treatment prior to being returned to the teritary filter. (Sinha-OEIS) W73-13329

METHOD FOR EFFICIENTLY SEPARATING SLURRY-STATE LIQUID INTO SOLID PART AND LIQUID PART AND AN APPARATUS THEREFOR, Kanegafuchi Boseki Kabushiki Kaisha, Tokyo

(Japan). (assignee) K. Takahashi.

U.S. Patent No. 3,741,388, 10 p, 5 fig, 1 tab, 4 ref; Official Gazette of the United States Patent Office, Vol 911, No 4, p 1299, June 26, 1973.

Descriptors: *Patents, *Waste water treatment, Sturries, *Filtration, *Liquid wastes, Pollution abatement, Water quality control, Water pollution control, *Waste treatment.

Slurry-state liquid waste is poured onto the sur-face of a liquid-permeable filter. The filter, made of foam, has good elastic recoverability from a compressed state. The liquid is absorbed in the foam whereas the mud-like solid part is retained on the surface of the filter. The filter is mounted on the surface of the filter. The filter is mounted on the circumference of a rotary drum. An endless belt serves to transfer the solids from the filter surface to the work surface of the belt. The solids carried on the endless belt are scraped off by a special scraper and allowed to drop into a collecting receptacle. A rotatable roll is placed in pressure

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contact with the surface of the foam filter and squeezes out the entrapped liquid which is fed into a lead away vessel. (Sinha-OEIS) W73-13330

PROCESS FOR TREATING SEPTIC BIOLOGICAL WASTES IN ARCTIC CLIMATES, Texaco, Inc., New York. (assignee)

E.L. Cole, and H. V. Hess. U.S. Patent No. 3,740,332, 3 p. 4 fig. 4 ref; Official Gazette of the United States Patent Office, Vol 911, No.3, p 1004, June 19, 1973.

Descriptors: "Patents, "Biological treatment, "Waste water treatment, "Oxidation, Biological oxygen demand, Chemical oxygen demand, Arctic, Pollution abatement, Water pollution control, Water quality control.

Identifiers: Septic biological wastes, Arctic environments.

A process provides a means of producing a clear effluent of low COD (BOD) which is sterile enough to be discharged into the Arctic environment and a part which may be burned or stored for removal from the Arctic. Wastes are passed into a primary settling zone. The temperature in the settling zone is held between 40 and 180F. The solids are moved to a coking zone and held at a temperature of 400 to 700F under a pressure of about 300 to 3500 p.s.i.g. for a period from 0.5 minutes to 2 hours. The coke is separated from the clear liquid. The cleared liquid (decoked) is mixed with effluent from the primary settler and the resulting mixture is air oxidized. Four examples are cited. (Sinha-OEIS)

PROCESS FOR THE REDUCTION OF THE BIOCHEMICAL OXYGEN DEMAND OF SEWAGE, AND FOR THE RECOVERY OF THE INTERENT PROTEIN,

Tatabanyai Szenbanyak (Hungary). (assignee) J. Holo, J. Toch, and I. Zagyvai. U.S. Patent No. 3,738,933, 2 p, 8 ref; Official Gazette of the United States Patent Office, Vol 911, No 2, p 627, June 12, 1973.

Descriptors: *Waste water treatment, *Patents, *Biochemical oxygen demand, *Sewage treatment, *Industrial wastes, *Dairy industry, *Fermentation, *Food processing industry, Slaughter, *Conservation, Pollution abatement, Water pollution control, Water quality control.

Identifiers: *Chemical treatment, Slaughter house wastes, Meat processing industry, Preserve factories.

A process is described for the purification of sewage, and, if required, for the recovery of the inherent protein from sewages. The biochemical oxygen demand of sewage of the type of meat, dairy and fermentation waste, is reduced by adding to the sewage at least 120 g/cu m of a water soluble aluminum salt or bivalent or trivalent iron salt, 0.5 to 1 kfi/cu m of bentonite or kaolin and 5 to 10 g/cu m of polymers or copolymers of acrylic acid-acrylic amide in the form of aqueous solution. The suspension is stirred and the pH adjusted to exceed 10 by addition of a basic calcium compound such as lime milk or calcium hydroxide. The precipitate thus obtained is separated by setting and transferred to a conical tank for treatment with carbon dioxide until the pH is no higher than 7, and the resulting precipitate is filtered and sterilized at a temperature above 130 degrees C, under pressure, to produce a biochemical culture medium or animal feed. (Sinha-OEIS)

METHOD FOR TREATING ACID WATER CON-TAINING METALLIC VALUES, Bethlehem Steel Corp., Pa. (assignee) P.D. Kostenbader. U.S. Pa8ent No. 3,738,932, 6 p, 1 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 911, No 2, p 627, June 12, 1973.

Descriptors: "Patents, "Aeration, "Sludge, "Metals, Alkalis (Bases), "Neutralization, "Acid mine water, Acidic water, "Waste water treatment, Pollution abatement, Water pollution control, Water quality control.

The method consists of treatment with an alkaliwater slurry and recycled sludge mix, with or without the presence of air, to neutralize the acidity of the water and to precipitate a substantial portion of the metals. The slurry consists of at least one alkali taken from the gnt iron salt, 0.5 to 1 kfi./cu m ofroup consisting of high calcium lime, magnesia, dolomitic lime and sodium hydroxide. This slurry is mixed with a portion of the densified sludge and the product is mixed with the acid water in a second reactor to cause the mix and acid to react in the presence of air. The precipitate is then allowed to settle out to form a densified sludge and a clarified neutralized water. (Sinha-OEIS)

ANNUAL SCIENTIFIC REPORT 1971
(RADIOACTIVE AND NON-RADIOACTIVE
CONTAMINATION OF THE ENVIRONMENT
AND THE METABOLISM OF SOME
RADIOELEMENTS; RADIOPHYSICAL CONTROL; RESEARCH ON BODY CONTAMINATION; WASTE DISPOSAL RESEARCH; N ONRADIOACTIVE ENVIRONMENTAL POLLUTION).
Centre d'Etude de l'Energie Nucleaire, Mol

Centre d'Etude de l'Energie Nucleaire, Mo (Belgium).

For primary bibliographic entry see Field 05B.

POTENTIAL FOR THE USE OF COBALT-60 IR-RADIATION IN THE TREATMENT OF WASTE

WATERS, North Carolina Univ., Chapel Hill. Dept. of Environmental Sciences and Engineering.

D. A. Okun. Available from NTIS, Springfield, Va., as TID-26341; \$4.00 in paper copy, \$1.45 in microfiche. Report No TID-26341, June 1973. 33 p, 47 ref.

Descriptors: *Cobalt radioisotopes, *Waste water treatment, *Sludge treatment, Water pollution, Water quality, Chemical degradation, Wastes, Organic wastes, Sludge, Disinfection, Water treatment, Settling basins, Economics, *Reviews, Waste disposal.

Identifiers: *Savannah River Plant, *Cobalt irradiation.

An evaluation of the potential for the use of cobalt-60 irradiation in the treatment of wastewaters is based primarily on a review of the literature in the field. Possible potential for cobalt-60 is in the degradation of organic pollutants and refractory chemicals in wastewaters, improvement in the settling characteristics of solids in wastewaters, improvement in the handling of wastewater sludges, and in the disinfection of wastewater sludges, and in the disinfection of wastewater shudges, cobalt-60 irradiation is not very effective in the degradation of pollutants, except for certain specific industrial wastes, and has only a limited impact on the settling characteristics of wastewater solids. It is effective in disinfection of wastewaters. However, even where radiation is effective, the costs for treating wastewaters by irradiation are likely to be far too high to be competitive with other processes that are already available. Cobalt-60 irradiation may be economically feasible for sludge treatment because sludge is more concentrated than wastewater. However, the benefits in sludge handling are not likely to be attractive because alternative methods are more acceptable and economical. The greatest potential is for sludge disinfection, but sludge disinfection is

not, nor is it expected to be, widely adopted. (Houser-ORNL)

ENERGY IMPLICATIONS OF SEVERAL EN-VIRONMENTAL QUALITY STRATEGIES, Oak Ridge National Lab., Tenn. For primary bibliographic entry see Field 05G. W73-13421

THE APPLICATION OF MODERN SOLVENT EXTRACTION TECHNIQUES TO THE REMOVAL OF TRACE QUANTITIES OF TOXIC SUBSTANCES FROM INDUSTRIAL EFFLUENTS,

Oak Ridge National Lab., Tenn.

W. S. Groenier.

Available from NTIS, Springfield, Va., as ORNL-TM-4209; \$4.00 in paper copy, \$1.45 in microfiche.

Report ORNL-TM-4209, July 1973. 17 p, 6 fig, 13 ref.

Descriptors: "Waste water treatment, "Solvent extractions, "Laboratory tests, "Mercury, "Separation techniques, Pollution abatement, Brine, Toxins, Chemicals, Metals, Peasibility studies, Effluents, "Industrial wastes, Organic compounds, Environmental engineering, Costs, Systems analysis, Design, Immiscibility, Solubility, Solvents.

Tests are proposed to test flowsheet feasibility, develop operating criteria, and eventually test procedures on actual effluents. Entrainment is minimized by internal recycle in each stage. Hg removal from chloralkali plant effluents (see W73-11107) would be the object of initial studies. The loaded organic phase (0.1 M tricaprylamine in an inert dilutent such as xylene) is stripped by a 2.5% ethylenediamine or propylenediamine solution. The extracted brine is recycled to eliminate a large fraction of the total effluent volume. For testing this process a laboratory-scale 4-stage mixer-setter was designed. The estimated fabrication cost is \$1000 per stage, including pump purchase and overhead. The residence time required for intimate mixing and subsequent coalescence is about 15 seconds per stage. Choice of an industrial-scale solvent extraction contactor is considered briefly. (Bopp-ORNL)

HEAT RECOVERY IN PROCESS PLANTS, Struthers Wells Corp., Warren, Pa. J. P. Fanaritis, and H. J. Streich. Chemical Engineering, Vol 80, No 12, p 80-88, May 28, 1973. 6 fig., 4 tab.

Descriptors: "Thermal pollution, "Heat exchangers, "Design, "Economic efficiency, Heat transfer, Steam, Steam turbines, Heat treatment, Cooling, Fuels, Costs, Economics, Evaluation, Planning, Power system operations, Industrial plants, Boiler feed water, Pre-treatment (Water). Identifiers: "Heat recovery systems.

Heat recovery systems can be used to generate steam, to pre-heat boiler feed water, to pre-heat combustion air, for steam superheating, to pre-heat process streams and for circulating heating systems. The primary equipment for heat recovery is broadly classified as either fire-tube or water-tube type depending on whether the elevated-temperature stream is flowing on the inside or the outside of the tubes. The broad range of heat recovery system applications makes it difficult to provide specific guidelines for economic evaluations. The following general guidelines are widely applicable: economic value of the recovered heat should exceed the value of the energy required to produce its equivalent; an economic evaluation of a heat recovery system must be based on a projection of fuel cost over the life of the equipment; environmental restriction must be considered; many elevated-temperature streams require cooling over

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a long temperature range; and fuel availability might affect the ability of a plant to maintain operations. (Jerome-Vanderbilt)

ESTIMATING COOLING TOWER COSTS FROM OPERATING DATA,

Chemical Engineering, Vol 79, No 13, p 118-119, June 12, 1972. 1 fig, 1 tab, 2 ref.

Descriptors: *Cooling towers, *Cost analysis, *Design criteria, Water cooling, Temperature, Heated water, Heat transfer, Atmosphere, Data collection, Operation and maintenance, Evaluation, Mathematical studies.

Cooling tower costs are estimated using four primary variables; the total heat load, the temperature of the water leaving the tower, the wet bulb temperature of the local atmosphere, and the temperature of the heated water entering the tower. Quick calculations have been developed which relate these factors to the published data on equip-ment and installation costs. The equation is ment and installation costs. The equation is presented and an example is given. A table presents a comparison of estimated and real cooling tower costs listing various characteristics. (Jerome-Vanderbilt) W73-13432

TREATMENT OF RADIOACTIVE STEAM-

GENERATOR BLOWDOWN,
NUS Corp., Pittsburgh, Pa. Cyrus Wm. Rice Div.
W. R. Greenaway, W. J. Klein, J. Markind, and R.

Industrial Water Engineering, p. 22-24, March/April 1973, 2 fig, 3 tab.

Descriptors: "Nuclear powerplants, "Radioactive wastes, "Waste water treatment, "On-site tests, Electric power production, Water pollution, Radioisotopes, Iodine radioisotopes, Phosphates, Boron, Ion exchange, Separation techniques, Laboratory tests, Boilers, Distillation, Reverse osmosis, Evaluation, Costs, Operation. Identifiers: "Blowdown.

To minimize waste water handling problems, methods of handling contaminated steam genera-tor blowdown were investigated. An ion exchange system design was attempted for radionuclides using a phosphate solution containing boric acid. The potentially contaminated wastes generated by the ion exchange would be 12 gpm when operating the long state of 45 gpm, exceeding the capacity of the radwaste system by three-fold. Flash distillation, shell and tube distillation and reverse osmosis were considered as alternate ap-proaches. The two distillation processes were rejected on the basis of equipment size and cost. A one-module reverse osmosis system was set up to test the effectiveness in removing phosphate, boron, and radioactive elements. A recovery of at least 90% was possible. At feed pH of 9.2-9.4, a membrane life of 2 years could be expected. Boron removal was about 65%. Six hundred operating hours with no change in performance have been logged in on-site testing, reducing radioactivity by a factor of 100 or more. No problems with jodines and cesium were anticipated as long as the water was recycled. No appreciable savings could be made by using the unit under no-leakage condi-tions. (Ierome-Vanderbilt)

DRY COOLING TOWER USES STEEL STRUC-

Hotery, Budapest (Hungary).

J. Bodas. Electrical World, Vol 177, No 7, p. 30-34, April 1, 1972. 4 fig.

Descriptors: *Cooling, *Cooling towers, *Heat transfer, *Structural design, Heated water, Struc-tural stability, Structural engineering, Thermal powerplants, Thermal pollution, Structural powerplants, Thermal pollution, Structural shapes.

Identifiers: "Air cooling, "Dry cooling towers,

Soviet Union, Hungary.

Natural-draft dry cooling towers are now being operated successfully in the Soviet Union rated for 200 Mw at nearly 6,000 ft. of elevation. An aluminum-covered steel structure, required because of high seismic loading, is believed to offer significant economic advantages even for more normal applications, and is believed to open the way to single-tower designs for plants rated up to 1,200 Mw. The plant uses the Heller cooling system adopted after the British, German and Hungarian experience. Design and operating details of the water flow, controlling the heat dissipation, protecting the cooling elements, stiffening the cylindrical section, and construction of the tower skirt, the air coolers and the condensers are discussed in Natural-draft dry cooling towers are now being the air coolers and the condensers are discussed in depth. (Oleszkiewicz-Vanderbilt) W73-13451

TREATMENT OF COMPLEX CYANIDE FOR REUSE OR DISPOSAL,

REUSE OR DISPOSAL, Berkey Film Processing of N.E., Fitchburg, Mass. T. N. Hendrickson, and L. G. Daignault. Copy available from GPO Sup Doc as EPI.23[2-73-269, \$2.10; microfiche from NTIS as PB-222 794, \$1.45. Environmental Protection Agency, Technology Series Report EPA-R-2-73-269, June 1973. 151 p, 41 fig, 15 tab, 81 ref. EPA Project 121 ORFF Project 12120 ERF

Descriptors: *Waste water treatment, Industrial wastes, Analytical techniques, *Chemical precipitation, *Chlorination, *Oxidation, *Ozone, *Electrolysis, Chlorine, Coagulation, Chemical wastes, Laboratory tests, Electrochemistry, Florenteits, Tentre Meany, meals, Toxicity, Coctation, Chemical Meany, meals, Toxicity, Coctation, Meany, meals, Toxicity, Coctation, Meany, meals, Toxicity, Coctation, Meany, meals, Toxicity, Coctation, Meany, meals, Toxicity, Coctation, Meany, meals, Toxicity, Coctation, Meany, Me wastes, Laboratory tests, Electrochemistry, Floc-culation, Heavy metals, Toxicity, Costs, Biochemical oxygen demand, Chemical oxygen demand, Water reuse, Recycling, Waste disposal. Identifiers: *Photofinishing wastes, *Ferricya-nide, Chemical recovery, *Cyanides.

Complex cyanides (ferro-and ferricyanide) in in-dustrial waste water effluents impose a direct threat upon the environment. Methods to recover threat upon the environment. Methods to recover or destroy these compounds were evaluated in laboratory studies. The techniques tested include electrolysis, ozonation, chlorination and heavy metal ion precipitation. The study was conducted to determine the feasibility of using one or more of these methods to reduce the concentration of ferricyanide in both concentrated (10,000 to 10 mg/l) and dilute (10 to 100 mg/l) waste effluent mg/l) and mitter (10 to 100 mg/l) waste ertitlents. Numerous analytical procedures were developed to enhance the accuracy of sample analysis over the concentration range studied. Ferrocyanide can be oxidized to ferricyanide in overflow photographic color process bleaches using either electrolysis or ozone and the waste bleach recirculated for reuse in the process. Dilute concentrations of ferricyanide can be destroyed using ozone or chlorine under proper conditions of temperature, chlorine under proper condition pH and catalyst addition. (EPA) W73-13468

REQUISITES FOR NON-POLLUTING MICRO-

BICIDES, R. A. Schultz, and B. A. Metz. Industrial Water Engineering, p 18-21, March/April 1973. 1 fig.

Descriptors: *Waste water treatment, *Boiler feed water, *Cooling water, *Microorganisms, *Foul-ing, Water quality, Water quality control, Industri-al water, Pre-treatment, Biochemistry, Water polat water, Fre-treatment, Biochemistry, Water pol-lution, Corrosion, Microbiology, Aquatic bacteria, Slime, Biocontrol, Toxins. Identifiers: Aliphatic diamine, Trialkyl benzylam-monium chloride.

Biological growth in industrial water systems results in inefficient operation and eventual malfunctioning. Organisms can enter the system and thrive in environs which would appear to be interested in the system and thrive in environs which would appear to be interested. Slime formation is the major problem because its glue-like nature allows it to adhere to virtually any surface and to cause fouling. Chlorine, polychlorophenate biocides and organic sulfur compounds have been used as controls in the past, but were either too corrosive, ecologically harmful, or ineffective at various pH levels. The present requirements for microbicides are biodegradability; a wide range of effectiveness; oxidation resistance; compatability at use levels with corrosion inhibitors; effectiveness at higher system water pH levels and penetrating and dispersing abilities against slime formations. The organic amine-type biocides currently available exhibit abilities in all these categories. Aliphatic diamine and trialkyl benzylammonium chloride are cannot admitted in all these categories. Auphante diamine and trialkyl benzylammonium chloride are two significant amine types. Two case histories are presented to demonstrate the effectiveness of microbiological growth control programs designed in accordance with the parameters outlined. (Jerome - V anderbilt) W73-13476

EFFECT ON WHEAT YIELD AND NITROGEN UPTAKE FROM MANURES MADE FROM SPENT-SLURRY,

ary bibliographic entry see Field 03F. For primar W73-13601

SOLUTE SEPARATION BY CONTINUOUS BUB-BLE FRACTIONATION, Rutgers - The State Univ., New Brunswick, N.J. B. T. Kown, and L. K. Wang. Separation Science, Vol 6, No 4, p 537-552, August 1971. 10 fig.

Descriptors: Waste treatment, *Waste water treatment, Surfactants, *Solutes, Bubbles, Adsorption, *Separation techniques.
Identifiers: Pollutant separation, *Bubble frac-

A continuous bubble fractionation system consisting of a vertical Plexiglas tube provided with a ing of a vertical riexigns tube provinced with a source of air bubbles, means of continuous liquid feed, overflow, and bottom effluent has been operated to study the performance of the system. The study primarily involves an examination of the effects of variables such as gas rate, liquid rate, solute concentration, and column size on the effectiveness of the section for the content of the section for rate, source concentration, and contain size on the effectiveness of the system for separating an organic solute from a dilute aqueous solution. The experimental results indicate that the effects of gas and liquid rate on the performance have generally followed the results expected from an equilibrium adsorption of a surfactant on the gasterial strate for the performance have grant of the performance of the p liquid interface described by Gibbs' equation and material balances. An increase in gas rate increased the effectiveness of the system by providing more adsorption surface. The adverse transfer of the solute by the eddy diffusion caused by rising bubbles was found to be the factor limiting the effectiveness of the system. W73-13638

CONTINUOUS BUBBLE FRACTIONATION:

PART I, THEORETICAL CONSIDERATION, Calspan Corp., Buffalo, N.Y. L. K. Wang, M. L. Granstrom, and B. T. Kown. Environmental Letters, Vol 3, No 4, p 251-265,

Descriptors: *Waste water treatment, Water quali-ty control, Evaluation, Bubbles, Solutes, Surfac-tants, *Adsorption, *Separation techniques. Identifiers: Pollutant separation, *Bubble frac-

The bubble fractionation process is one of a number of adsorptive bubble separation methods which involves the use of selective adsorption of

Group 5D—Waste Treatment Processes

surface-active solutes at the gas-liquid interfaces of the rising bubbles in a bubble column. It can be used as an advanced treatment method for certain industrial effluents or domestic sewage which conmoustrai erruents or domesus sewage which contain surface-active substances. In this study, a theory for continuous operation of the bubble fractionation process was developed. The theory involves: (a) the adsorption of surface-active solutes at rising bubble surfaces; and (b) balancing flow in the bubble column against axial diffusion. flow in the bubble column against axial diffusion and the departure of solutes from the fractionation system. Theoretical analyses imply that the effectiveness of the continuous bubble fractionation system increases with increasing gas rate and the surface activity of the solute but decreases with increasing column cross-sectional area, axial diffusion and bubble size. W73-13639

CONTINUOUS BUBBLE FRACTIONATION: PART II, EFFECTS OF BUBBLE SIZE AND GAS

RATE, Calspan Corp., Buffalo, N.Y.

L. K. Wang, M. L. Granstrom, E. L. Bourodimos, and B. T. Kown

Environmental Letters, Vol 4, No 3, p 233-252,

Descriptors: *Waste water treatment, Water quality control, Evaluation, Bubbles, Solutes, Surfac-tants, Adsorption, *Separation techniques. Identifiers: Pollutant separation, *Gas rate, *Bubble size, *Bubble fractionation.

Theoretical equations developed for continuous bubble fractionation process have been evaluated experimentally using bubble size and gas flow rate as variables. Variations of bubble size and gas flow rate, which will affect the column per-formance of either batch or continuous bubble fractionation system, are predicted by the developed theory. Based on theoretical development and experimental verifications, several approaches for the improvement of the bubble fractionation system are suggested. W73-13640

CONTINUOUS BUBBLE FRACTIONATION: PART III, EXPERIMENTAL EVALUATION OF FLOW PARAMETERS, Calspan Corp., Buffalo, N.Y.
K. Wang, M. L. Granstrom, E. L. Bourodimos,

Environmental Letters, Vol 5, No 2, p 71-89, 1973.

Descriptors: *Waste water treatment, Water quality control, Evaluation, Bubbles, Solutes, Surfactants, Adsorption, *Separation techniques.
Identifiers: *Liquid flow rates, Gas rate, Pollutant separation, *Bubble fractionation.

The performance of a bubble fractionation process was investigated experimentally using liquid flow rate and gas flow rate as variables. Based on an ideal model, the theoretical performance of the continuous bubble fractionation process was qualitatively evaluated.Experimental results indicate that an increase in the bottom effluent rate while keeping the overflow rate constant increases the solute concentration in the top overflow. An increase in overflow rate while keeping the bottom effluent rate constant decreases the solute concentrations of top overflow, but decreases insignificantly the bottom effluent's solute concentration When the feed rate is constant, optimization of the bubble fractionation system can be achieved by regulating the top-to-bottom flow rate ratio. For practical engineering application, a meaningful combination of physical dimensional parameters into dimensionless operational charts can be useful for plant operators in operating the continuous bubble fractionation process. W73-13641

EVALUATION AND DEVELOPMENT OF PHYSICAL-CHEMICAL TECHNIQUES FOR THE SEPARATION OF EMULSIFIED OIL

THE SEPARATION OF EMULSIFIED OIL FROM WATER, Calspan Corp., Buffalo, N.Y. K. Wang, Y. Yang, and B. Dahm. Technical Report, Calspan Report No. 189, 31 p, 7 tab, 40 ref, May 1973.

Descriptors: *Waste water treatment, Evaluation, Flotation, Magnetization, Coalescence, Chromatography, *Filtration, Reverse Osmosis, *Asorption, Coagulation, *Polyelectrolytes, Sedimentation, Oil, Physicochemical properties, *Separation techniques, Emulsions, Oil-water interfaces. Procipies. terfaces, Reveiws.
Identifiers: Oil Pollution Control, *Carbon adsorp-

Various methods for separating emulsified oil from water were surveyed and investigated. A state-of-the-art review of physical-chemical processes for oil-water separation included conventional coalescence, chromatography, layer filtration, reverse osmosis, absorption filtration, hydrocyclone, centrifugation, settling, chemical coagulation, evaporation/distillation, freezing, biological oxidation, clarification, flotation, and solvent extraction. A search for some universally solvent extraction. A search for some universall applicable methods for the separation of emul-sified oil from water was made. Promising physiocochemical processes for oil-water separa physicochemical processes for our-water separa-tion include: (1) granular carbon adsorption; (2) powdered carbon adsorption followed by polyelectrolyte coagulation and final polishing; and (3) powdered carbon adsorption followed by direct filtration. Greater than 99% oil removal can be achiaved with these processes. be achieved with these processes. W73-13642

EFFECT OF CALCIUM LIGNOSULFONATE ON PROPERTIES OF CONCRETE AT EARLY AGES,

Missouri Univ., Rolla.

L. K. Wang. M. S. Thesis, 1965. 63 p, 7 tab, 23 fig, 11 ref.

Descriptors: Lignins, Sulfonates, Sulfite liquors, Pulp wastes, Concretes, Cements, *Recycling, *Water reuse, Concrete mixes, Compressive strength, Tensile strength, *Concrete additives. Identifiers: Calcium lignosulfonate, Concrete beam, Concrete cylinder, *Lignosulfonates.

Lignosulfonate (or lignin sulphonate) is a plant constitutent which is often discharged as waste during the manufacture of paper by the sulfite pulp during the manufacture of paper by the sulfite pulp process. This giant polymer waste constituent is difficult to remove by biological treatment techniques. A new tendency of paper and pulping waste treatment is the recovery of lignin from the wastewater for reuse. In this program, the feasi-bility of using the recovered lignosulfonate as a concrete admixture was investigated. Lignosul-fonate was tested for its effect on the tensile and compressive strength of plain concrete cylinders, and for its effect on the flexural strength of plain concrete beams. The effect of the admixture on concrete beams. The effect of the admixture on shrinkage, slump, air content and unit weight was also studied. The test results showed that lignosulfonate reduces the amount of water required to make a workable concrete mix; a more workable mix saves money because it is easier to place, thus mix saves money occause in a caster to prace, must reducing labor requirements for the project. Reducing the water content while leaving the ce-ment factor unchanged results in concrete of higher tensile, compressive and flexural strengths at all ages. W73-13644

EFFECT OF PH ADJUSTMENT UPON AC-TIVATED CARBON ADSORPTION OF DIS-SOLVED ORGANICS FROM INDUSTRIAL EF-

Calspan Corp., Buffalo, N.Y.

L. K. Wang, R. P. Leonard, D. W. Goupil, and M. H. Wang.

Preprint presented at the 27th Annual Purdue Industrial Waste Conference, Purdue University, Lafayette, Indiana, May 1972: 22 p, 5 tab, 17 ref.

Descriptors: "Hydrogen ion concentration, "Activated carbon, "Waste water treatment, Polymers, Hydrolysis, "Adsorption, Pulp, Wastes, Lignins, "Industrial wastes, Solutes. Identifiers: Adsorption capacity, Adsorption rate, "Dissolved organics, Glue factory wastes.

The influence of the initial hydrogen ion concentration on carbon adsorption of organic solutes was reviewed and studied experimentally. The adsorption mechanisms describe carbon adsorption sorption mechanisms describe carbon assorption of single organic compounds from aqueous solu-tions. Since industrial effluents generally include multicomponent organic solutes, the optimum pH for activated carbon treatment of specific industrial effluent must be determined experimentally because many competing adsorption mechanisms are involved. W73-13646

TREATMENT OF GLUE FACTORY WASTES BY PHYSIOCOCHEMICAL PROCESSES, Calspan Corp., Buffalo, N.Y.
Lawrence K. Wang, Richard P. Leonard, and

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Dennis W. Goupil. Project Report VT-3045-M-3, 79 p, 9 fig, 12 tab, 72

Descriptors: *Waste water treatment, Recycling, Water reclamation, *Activated carbon, Adsorption, *Coagulation, *Filtration, *Chlorination, Cost analysis, Physicochemical properties. Identifiers: Tannin, *Glue factory wastes, Carbon adsorption.

In an animal glue plant, the two waste streams of greatest concern are the alkaline waste containing lime, protein, blood, and dirt from the lime curing and washing operations, and the acid waste con-taining sulfuric acid, chromium sulfate, dissolved organics, and hydrochloric acid from the acid treatment, washing, and neutralization operations. There has been little success in developing adequate and economical methods for the abatement of glue factory pollutant discharges. The treatment procedures investigated were equaliza-tion, sedimentation, carbon adsorption, coagulasand filtration and chlorination. Two con tion, sand illuration and canomation. I we concep-tual physicochemical waste-treatment systems are proposed in what is believed to be an optimum combination of appropriate unit processes. Ex-perimental results indicate that high reductions of chemical oxygen demand, dissolved protein, tan-in, suspended solids, chromium, turbidity, and color could be achieved by the proposed waste-treatment systems. The purified effluent could be recycled for in-plant use in glue factory opera-tions. tions. W73-13647

SURFACE ADSORPTION: A PROMISING AP-PROACH FOR THE TREATMENT OF TAN-NERY EFFLUENTS, Calspan Corp., Buffalo, N.Y.

Calspan Corp., Buffalo, N.Y. L. K. Wang. Project report VT-3045-M-Z, 60 p, 11 fig, 11 tab,

Descriptors: *Waste water treatment, *Adsorption, Physicochemical properties, Carbon, *Flotation, Foam separation, Surfactants, *Tannery wastes, Industrial wastes, *Water reuse.
Identifiers: *Surface adsorption, *Combined treat-

Three candidate physicochemical processing techniques for removing pollutants from tannery effluent are described which allow a greater bulk of the wastewater to be reclaimed as a useful

Water Treatment and Quality Alteration—Group 5F

water resource. Organic substances, and Cr, under certain circumstances, can also be recovered as useful by-products. The techniques are specific surface adsorption processes: Ioam separation without additives, adsorbing colloid flotation, and adsorption flotation. Foam separation without additives is not feasible for the removal of either dissolved organics or suspended solids from tannery wastes. Adsorbing colloid flotation is feasible for the primary treatment of tannery wastes, provided that dimethyldihydrogenated-tallow ammonium chloride or the like is used as a collector. Adsorption flotation, combining carbon adsorption and flotation into a single process, can achieve a high fractional removal of both dissolved and suspended pollutants. Utilizing carbon adsorption and flotation in series would have the same efficiency as that of adsorption flotation. Other auxiliary physicochemical unit processes, such as sedimentation, sand filtration, lime precipitation, and centrifugation, are also investigated.

W73-13648

5E. Ultimate Disposal of Wastes

FEASIBILITY OF USING PULP MILL SLUDGE AS AN ADDITIVE TO CORRUGATING MEDIUM, Washington Univ., Seattle. Coll. of Forest

Resources.

May 1972, 31 p. 12 fig, 4 tab, 10 ref, append. OWRR-A-043-Wash (2).

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Descriptors: Pulp and Paper Industry, "Pulp wastes, Waste disposal, "Sludge disposal, Indus-trial wastes, Effluents, Water reuse, "Recycling. Identifiers: "Pulp mill sludge.

This research was concerned with a method to dispose of the ever accumulating sludge which comes from the clarifiers when the solids are removed from the effluent waters of a pulp mill. The objective was to determine if sludge could be used as an extender in corrugating medium. The main idea was to utilize the sludge rather than simply dispose of it. Sludge from three different type mills was added in quantities of 10, 20 and 40 percent to a commercial corrugating medium furnish. Handsheets made by an improved laboratory method were tested for flat crush strength. The addition of sludge to the commercial furnish reduced the flat cursh strength. The reduction is believed accounted for at least in part by the excessive chemical fiber content of the experiment furnish. Therefore, further tests, varying the fiber cessive chemical fiber content of the experiment furnish. Therefore, further tests, varying the fiber mix, are needed before the idea of using sludge in corrugating medium can be discarded. The mechanism of flute failure during the flat crush test was investigated. Pressing the medium at 130 psi after drying gave maximum flat crush strength of creater pressures decreased strength due to reduced caliper which more than offset any further improvement due to increased density of the sheet.

W73-13081

PRELIMINARY REPORT ON THE DISPOSAL OF OIL-FIELD BRINES IN THE RITZ-CANTON OIL FIELD, MCPHERSON COUNTY, KANSAS, Bureau of Mines, Bartlesville, Okla. Petroleum Experiment Station.
For primary bibliographic entry see Field 05G. W73-13564.

5F. Water Treatment and **Quality Alteration**

SECONDARY SEWAGE TREATMENT IN PIPELINE CONTACTORS, Delaware Univ., Newark. Dept. of Chemical En-For primary bibliographic entry see Field 05D.

W73-13077

EFFECTS OF A POLYELECTROLYTE AS A EFFECTS OF A POLITICAL ROLLING.

Detroit Dept. of Water Supply, Mich.

M. A., Garnell.

Journal of the American Water Works Association, Vol 55, No 5, p 597-601, May 1963. 2 ref.

Descriptors: "Water treatment, "Electrolytes, "Filtration, Water quality, Turbidity, Mixing, Flocculation, Head loss, "Polyelectrolytes, "Fil-

The safety and palatability of water increases with the degree of clarity. The danger of passage of viruses into drinking water is reduced when a high degree of turbidity removal is achieved. In addition, the recently developed chemicals, pesticides, and fertilizers in increasing variety and quantity are finding their way into water sources; some of these materials are obnoxious and even dangerous to public health. Therefore, filters should be maximum efficiency. At one Detroit water treatment nese materials are obnoxious and even dangerous to public health. Therefore, filters should be maximum efficiency. At one Detroit water treatment plant, which has a mixing chamber with a retention time of about 5 minutes, slugs of industrial wastes sometimes caused poorer filtered water quality for several hours. The same raw water conditions often go unnoticed at two other plants where long periods of flocculation are provided. A polyacrylamide with a molecular weight of approximately 1,000,000, which is slightly anionic (Separan NP 100) was tested as a filter aid. At continuous dosage of 20 ppb the effluent turbidity is reduced from 0.5 to less than 0.1 unit in about 2 hours. If dosing is discontinued, turbidity again increases in about 2 hours. At less than 10 ppb dosage, the minimum turbidity remained about 0.1 unit. Application of the electrolyte directly to the filters increases the rate of head loss in proportion to the dosage rate. At 10 ppb the rate of increase in head loss was 30-40% higher and at 30 ppb approximately 100% higher. (Bean-AWWARF)

OPTIMUM ECONOMICAL DESIGN FOR MU-NICIPAL DIATOMITE FILTER PLANTS.

INCAPAL DIATOMITE FILTER PLANTS, lowa State Univ., Ames. E. R. Baumann, and R. L. LaFrenz. Journal of the American Water Works Association, Vol. 55, No 1, p 48-58, January 1963. 6 fig. 5 tab., 5 ref.

Descriptors: "Water treatment, "Filters, "Design, "Diatomaceous earth, "Flow rates, "Economics, "Automation, Head loss.
Identifiers: "Diatomite filters, Filter aids, Coagulations: "Diatomite filters, Filter aids, Coagulations", "See "Diatomite filters, Filter aids, Coagulations", "Diatomite filters, Filter aids, Coagulations," "Diatomite filters, Filter aids, Coagulations, "Diatomite filters," "Descriptors," "Descriptors, "Descripto

The design of a diatomite filtration plant should be based on an optimum combination of filtration rate, filter cake terminal-baed loss, and rate of body feed which will produce potable water at a minimum cost. The cost is a function of labor, power, diatomite, and equipment. A method of finding the optimum is demonstrated. Conclusions are (1) With manual operation, short filter runs are not economical, (2) Of three filtration rates tested, are (1) with manual operation, short litter runs are not economical, (2) of three filtration rates tested, a rate of 1 gpm sq. ft. was optimum, (3) Optimum body feed was relatively low; with 7-8 ppm iron in the water the optimum was 40 ppm diatomite, (4) Terminal head losses between 50 and 100 ft. of water were optimum at low body feed rates, since long runs were necessary for the labor economy, (5) At high body feed rates power becomes the dominating factor and lower terminal head loss produced the minimum cost, (6) Automation reduced the terminal-head loss for minimum cost, (7) Automatic operation resulted in largest production cost saving for the smallest city, however maintenance could be a problem if qualified personnel were not readily available, (8) Lower iron concentrations were cheaper to filter, (9) Production costs were less for a large city than for a small city, and (10) Production costs could be 400-500% higher than necessary if other than optimum conditions of flow rate, terminal-head loss, and body feed were used. (Bean-AWWARF) W73-13090.

ANALYSIS OF ORGANIC CONSTITUENTS PRESENT IN DRINKING WATER, Vysoka Skola Chemicko-Technologicka, Prague (Czechoslovakia). Dept. of Petroleum Technology and Petrochemistry. For primary bibliographic entry see Field 05A. W73-13240

ADSORBING AND ADHESIVE MATERIALS FOR VIRUS REMOVAL FROM WATER, (IN

FUR VIRUS ARUSSIAN, M. Lastovets', M. M. Rotmistrov, M. F. Holub, and L. S. Radolyte'ka.

Dopov Akad Nauk Ukr RSR Ser B Heol Heofiz Khim Biol. Vol 33, No 11, p 1036-1038. 1971. En-

Minerals including polygorskite, bentonite, agloporite, vermiculite, permutite, pyrophyllite, gypsum and silica gel can remove viruses by precipitation in water to secure more complete disinfection.—Copyright 1973, Biological Abstracts,

THE PRESENT STATUS OF RESEARCH ON THE DISINFECTION OF DRINKING WATER

IN THE USSR, Moskovskii Gosudarstvennyi Meditsinskii Institut (I) (USSR).

(I) (USSN). S. N. Cerkinskij, and N. Trahtman. Bull WHO. Vol 46, No 2, p 277-283. 1972. Illus. Identifiers: Chlorine, Disinfectants, *Disinfection, Enterobacteriaceae, Enteroviruses, Gamma-rays, Ozone, USSR, Virucides, *Water treatment, *Potable water.

Recent USSR research was aimed at evaluating methods of disinfecting drinking water and at elucidating the mechanisms involved. The use of chlorine, ozone, and gamma-rays was discussed, as were their advantages and disadvantages and their effects on Enterobacteriaceae and on enteroviruses.—Copyright 1973, Biological Abstracts Inc. stracts, Inc. W73-13390

WATER TREATMENT FOR HEATING AND PROCESS STEAM BOILERS, K.W. Herman, and L. R. Gelosa. Power Engineering, Vol 75, No 4, p 54-57, April

1973. 3 fig, 1 tab.

Descriptors: "Boiler feed water, "Water treat-ment, "Corrosion control, Water quality control, Water quality, Boilers, Deaeration, Filtration, Water softening, Demineralization, Scaling, Ox-idation, Heating, Heated water.

Boiler feed water treatment programs for the purposes of preventing deposit formation, control of corrosion and prevention of to boiler water carryover are discussed. Consideration of the whole system must be made when choosing a treatment program. The treatments considered are filtration, sodium zeolite softening, hot lime softening followed by filters and sodium zeolite softening, cold lime clarification and partial softening followed by filters. filters and sodium zeolite softening, cold lime clarification and partial softening followed by filters and sodium zeolite softeners, and demineralization. Sludge conditioners containing polymers, organics, sequesterants, iron sequesterant-dispersant, and antifoam prevent deposits while acting as an on-stream cleaner.

Group 5F-Water Treatment and Quality Alteration

Chelates, if carefully used, will prevent scaling and baked on sludge. Water carryover which reduces steam quality and leads to after boiler deposits, plugged values and traps, and turbine damage, can be prevented by steam separation device maintenance and use of antifoam agents. Corrosion due to oxidation can be reduced by deaeration of the feedwater. Adjustment of pH is another method of preventing corrosion. (Jerome -Vanderbilt) W73-13462

MAGNETIC TREATMENT OF WATER. Informatics, Inc., Rockville, Md.

ailable from NTIS, Springfield, Va 22151 a AD-757 887 Price \$3.00 printed copy; \$1.45 microfiche. Report, January 30, 1973. 2 fig, 6 ref. ARPA Contract No F44620-72-C-0053.

Descriptors: *Water treatment, *Scaling, *Boilers, *Reviews, *Magnetic studies, Water softening, Water chemistry. Identifiers: *Magnetic treatment (Water).

A magnetic field of some 100 to 1000 oersteds is effective in preventing the formation of scales or incrustations in boilers and heating systems. After magnetic treatment, natural water does not, when heated, produce a hard scale on the walls of the boiler or in heating pipes, but rather a loose sludge which settles to the bottom and can easily be removed or flushed without acid treatment. A large number of papers pertinent to magnetization and to such questions as how a magnetic field acts on water, for what purposes magnetic treatment is effective, and under what conditions it is most effective and efficient, have been published in the Soviet Union over the last 20 years. In some cases the conclusions drawn by various authors, based on laboratory experiments, have been completely contradictory. The only fact which is generally agreed upon seems to be that a magnetic field reduces the kinetics of crystallization processes and the freedom of movement of charged parti-cles. (Knapp-USGS) W73-13544

ELECTROPHORETIC EVALUATION AND PROCESS CONTROL.

Philadelphia Water Dept., Pa. E. L. Bean, S. J. Campbell, and F. R. Anspach. Water Works and Wastes Engineering, Vol 2, No 11, p 47-51, Nov. 1965. 5 fig, 1 tab, 5 ref.

Descriptors: *Water treatment, Sanitary engineering, *Water quality, *Zeta potential, Electrophoresis, *Colloids, Oxidation, Hydrogenion concentration, Activated carbon, Kalonite, Color, Turbidity, Taste, Odor. Identifiers: *Process control.

Studies and plant experience have demonstrated that: odor-producing materials do not associate to any major extent with hydrophobic colloids; High negative zeta potential indicates the colloids are hydrophilic, normally indicating wastes or sewage pollution; ZP is a dominant factor in coagulation control; ZP control of coagulation processes can produce savings; ZP and pH zones, once established, for any type of treatment, may thereafter be utilized for control. Present information indicates that: color removal with alum coagulant requires neutral to slightly positive ZP; Color removal with ferric coagulant is best with slightly positive ZP; Turbidity removal requires negative ZP, the magnitude required varying greatly in the presence of different clays; Removal of hydrophilic colloids will reduce odors in plant effluents. Presently no method of effecting direct removal of dissolved organics has been developed, other than adsorption by activated carbon, possibly calcined kaolin or chemical oxidants. (Bean-AWWARF) W73-13547

FLOATING AERATOR, Yeomans Brothers Co., Melrose Park, Ill.

J. A. Roeber, R. J. Nogaj, E. J. Ciabattari, and E.

Water Works and Wastes Engineering, Vol 2, No 12, p 64-66, Dec. 1965. 4 ref.

Descriptors: *Water treatment, *Water quality, *Aeration, Dissolved oxygen, Efficiencies, *Design.

It has been demonstrated that artificial aeration of an oxygen-deficient stream, using a floating aera-tor system, is a feasible method for raising the dissolved oxygen content. Tests at three sites showed that dissolved oxygen concentration of the river could be increased with energy efficiencies varying from 0.82 to 2.7 lb of oxygen per hp-hr. Effi-ciency decreased as the concentration of DO in-creased. Maximum efficiencies are obtained when the units are placed at points of low DO and high velocity of flow, with the aerators placed across the stream, not one downstream from the other. For equal oxygen transfer, many small aerators will require less power than a few large aerators. However, other costs normally decrease with increasing unit size. The sizing of aerator units should be established after investigating the stream under consideration. The oxygen transfer efficiencies reported were somewhat less than those normally obtained in an activated sludge plant. However, river aeration requires no cost for tankage. A new aerator blade was developed which produced higher efficiencies than those previously manufactured. (Bean-AWWARF) W73-13548

TREATMENT OF ACID MINE WATERS, Rohn and Haas Co., Philadelphia, Pa.

F. Pollio, and R. Kunin. Water and Wastes Engineering, Vol 4, No 8, p 64-66, Aug. 1967. 2 fig, 4 tab.

Descriptors: *Water treatment, Water quality, Water softening, *Mine water, Hardness (Water), Lime, *Anion exchange, *Resins, Aeration, Coagulation, Sedimentation, *Electrolytes. Identifiers: Amberlite IRA-68.

A basic process has been developed whereby a 3,000 ppm acid mine drainage water may be processed to yield water suitable for industrial, agricultural and domestic purposes. The process is based on use of the conventional gel anion exchange resin, Amberlite IRA -68, which, used in a column operation, functions in the bicarbonate cycle. The effluent water is aerated and clarified to give useful water, whose quality may be further improved through lime softening. In the clarification step, improved clarification and sedimentation rates may be obtained using an anionic polyelectrolyte. Because some precipitation may occur during alkalization, it has been necessary to operate in an unconventional upflow manner durig the ion exchange step. No noticeable pressure ing the ion exchange step. No nouceanic pressure drop nor deposition of precipitates into the resin exchange capacity has been achieved. The process possesses much flexibility, and a water of practi-cally any desired quality may be obtained, something that direct lime neutralization methods have not achieved. (Bean-AWWARF) W73-13549

A LITTLE PHENOL STIRS UP A LOT OF PUBLIC RELATIONS,

Wilmington Water Cept., Del. M. S. Shane.

Water Works Engineering, Vol 115, No 5, p 340-342, May 1962.

Descriptors: *Water treatment, *Public health, *Taste, *Odor, Chlorination, *Activated carbon, Monitoring, Water pollution, *Phenols, Monitoring, Identifiers: Wilmington (Del).

Wilmington water department has been plaqued at times with phenol-type pollution in concentrations of 10 to 25 ppb in the Brandywine creek, particularly in December and January. The pollution is of a batch nature. Because of its intermittency it is a batch nature. Because of its intermittency it is hard to locate the source, particularly across state lines. The two state agencies must work together. A different source has been responsible each time. It is detected at the plant which is approximately 24 hours away from the points of pollution. Odor tests are run every hour, after chlorination to produce the chloro-phenol if present. Activated carbon is applied continuously but if a lag in increased dosage occurs when the phenols are received there is a clamor of telephone calls. Most of such problems occur late at night or in early of such problems occur late at night or in early morning when laboratory personnel are not im-mediately available. Taste tests are used after filtering the raw water through a membrane filter and chlorinating it. Sometimes the phenol is detected by this method when it was not detected by odor. In the past five years threshold taste above 1 has been present 2 1/2 days per year, or less than 1 per-cent of the time. (Bean-AWWARF) cent of the W73-13550

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RESULTS OF DRINKING WATER TESTING IN THE SZCZECIN PROVINCE AREA UN-DERTAKEN AS PROPHYLACTIC MEASURE AGAINST ALIMENTARY POISONING OF IN-FANTS, (IN POLISH), For primary bibliographic entry see Field 05A. W73-13581

ON BACTERIAL AFTERGROWTH IN DRINK-ING AND INDUSTRIAL WATER: I. THE IN-FLUENCE OF ION-EXCHANGE PLANTS (IN

GERMAN), Hygiene-Institut, Frankfurt am Main (West Germany). Abteilung Hygiene. R. H. W. Schubert.

R. H. W. Schubert.

Zentralbl Bakteriol Parasitnekd Infektionskr Hyg
Erste Abt Orig Reihe B Hyg Praev Med, Vol 155,

No 5/6, p 488-501, 1972, Illus, English summary.
Identifiers: Alcaligenes, Bacteria, *Bacterial aftergrowth, Disinfection, Ions, Pseudomonas spp,
*Potable water, *Industrial water, *Ion exchange.

Comparative examinations carried out on ionexchanger plants showed that the mode of their ac-tion is essential to the degree of bacterial aftergrowth developing in the water on its passage through the exchanger bed. Intermittent operation of the exchanger including prolonged hold-up periods of the water in the exchanger bed will promote bacterial growth. When the water is being used continuously, or when certain amounts of it are employed or decanted automatically every hour, bacterial growth does not occur or is kept nour, bacterial growth does not occur or is kept within limits. The numbers of bacteria show no additional increase in the course of its passage through the ion exchanger. Model experiments showed that the exchanger functions mainly as a large surface. Studies on the organisms responsible for bacterial aftergrowth showed that certain Pseudomonas species present at lesser or higher numbers in the tap water preferentially propagate numeers in the tap water preterentially propagate in the exchanger bed since the relative numbers of other Pseudomonas species occurring in tap water show a decline. The gram-positive bacteria more or less commonly found in tap water usually propagate at a lower rate than the Pseudomonas species do. In one of the plants examined, a distinct increase was noted in the content of bacdistinct increase was noted in the content of bac-teria belonging to the Alcaligenes group. The fol-lowing conclusions were drawn: the flow through the ion-exchanger plant should be kept as continu-ous as possible, regular disinfection, e.g., simul-taneously with regeneration, will be successful only when the period of contact with the disinfec-tant of the exchanger is kept as long as possible. With the currently used methods of exchanger regeneration, the period of contact is not suffi-cient.--Copyright 1973, Biological Abstracts, Inc. W73-13629

Water Quality Control—Group 5G

5G. Water Quality Control

INSTITUTIONAL REQUIREMENTS FOR OP-TIMAL WATER QUALITY MANAGEMENT IN ARID URBAN AREAS, Colorado State Univ., Fort Collins. Environmental

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Colorado State Univ., Fort Collins. Environmental Resources Center.
W. R. Walker, G. V. Skogerboe, R. C. Ward, and T. L. Huntzinger.
Available from the National Technical Information Service as PB-222 495, \$3.00 in paper copy, \$1.45 in microfiche. Completion Report Series Partial Report No 48, June 1973. 39 p, 3 fig. OWRR-B-071-COLO (4).

Descriptors: "Farm wastes, "Institutional constraints, Mathematical models, "Optimization, System analysis, Urbanization, Waste water treatment, "Water management (Applied), "Water quality, Water supply, "Alternative planning, "Regional analysis. gional analysis.
Identifiers: *Arid-urbanizing regions.

Water management strategies in arid urbanizing regions require careful evaluation of alternatives for supplying future demands and controlling water quality. Mathematical models were developed which describe the interrelationships among various institutional factors in order to delineate the requirements for implementing opamong various institutional factors in order to delineate the requirements for implementing optimal policies. The first of two study areas selected to test the utility of the models is Denver, Colorado. This area is an excellent example of an area where the conditions of water scarcity and increasingly stringent water quality standards are critical. The Utah Lake drainage area in central Utah is the second region considered. In this region, water quality management is necessary to insure the continued use of water in the downstream ropulation center, of the state. Together, these sure the continued use of water in the downstream population center of the state. Together these models produce results useful in determining the optimal strategies for water management in arid urbanizing areas. A generalized summary is presented to integrate these findings into a West-wide evaluation of this problem. W73-13002

COMPLEXES AFFECTING THE SOLUBILITY OF CALCIUM CARBONATE IN WATER, Illinois State Water Survey, Champaign. For primary bibliographic entry see Field 02H. W73-13004

DETERMINATION OF OPTIMAL MULTIPLE USES OF A SMALL WATER RESOURCE, Massachusetts Univ., Amherst. Water Resources Research Center.
For primary bibliographic entry see Field 06A.
W73-13009

FEASIBILITY OF PLASTIC FOAM PLUGS FOR SEALING LEAKING CHEMICAL CON-TAINERS

TAINERS,
Rockwell International Corp., Canoga Park, Calif.
Rocketdyne Div.
R. C. Mitchell, C. L. Hamermesh, and J. V. Lecce.
Copy available from GPO Sup Doc as
EP1.23/2:73-251, \$0.85; microfiche from NTIS as PB-222 627, \$1.45. Environmental Protection Agency Technology Series Report EPA-R2-73-251, May 1973. 60 p, 22 fig. 3 tab, 4 ref. EPA Pro-ject 15090 HGW. 68-01-0106.

Descriptors: Water pollution control, *Sealants, Chemicals, *Leakage, *Accidents, *Transporta-

tion, Plastics.
Identifiers: Hazardous chemical spills, *Chemical container leaks, *Plastic foam plugs.

A program was conducted to evaluate the feasibili-ty of methods for plugging leaks in damaged chemical containers by application of suitable plastic barriers. Such a system would be valuable in helping to prevent water pollution from spilled

hazardous chemicals. A large number of candidate scalants were evaluated in laboratory screening tests, including various urethane foams; polystyrene and polyvinyl acetate instant foams; filled and unfilled epoxy systems; and polysulfide, butyl, neoprene, and silicone rubber systems. The most promising results were obtained with the urethane foams. Additional evaluation and scaleup tests were made, including scaling of leaks of many different hazardous chemicals, application to leaks both under water and in air, and scaling of leaks in 55-gallon containers. The feasibility of this concept was demonstrated. As a consequence of the success already realized, it is probable that a practical and useful system, embodying this approach, can be developed. (EPA)

DATA ACQUISITION SYSTEMS IN WATER QUALITY MANAGEMENT, Colorado State Univ., Fort Collins. Dept. of

Agricultural Engineering. R. C. Ward.

Copy available from GPO Sup Doc as EPI.23/3:73-014, \$2.85; microfiche from NTIS as PB-222 622, \$1.45. Environmental Protection Agency, Socioeconomic Studies Series, Report Agency, Socioeconomic Studies Series, Report EPA-R5-73-014, May 1973. 259 p, 25 fig, 9 tab, 10 ref. EPA Project 16090FUO.

Descriptors: Sampling, Information retrieval, *Network design, Cost comparisons, Monitoring, Operations, Data collections, Water quality con-trol, *Colorado, *Water quality standards, *Regu-lation.

Identifiers: *Water quality management, *Data acquisition systems.

The role of routine water quality surveillance was investigated, including a delineation of the objectives of a state water quality program based upon the state and federal laws. Seven specific objectives are listed under the two general objectives of prevention and abatement: planning, research, aid programs, technical assistance, regulation, enforcement, and data collection, processing, and dissemination. Each objective was broken down into the general activities required for its accom-plishment and the data needed for each activity were identified. A survey of systems for gra sampling, automatic monitoring, and remote sensing was performed, each data acquisition technique being analyzed for capabilities, reliabili-ty, and cost. A procedure was developed for desigty, and cost. A procedure was surveillance program responsive to objectives. The design procedure has two major aspects: (1) determination of the responsive to objectives. Inc design procedure has two major aspects: (1) determination of the agency's control strategy, and (2) characterization of streams according to use and quality conditions. The optimum grab sampling network is then designed and possibilities of substituting automatic monitoring and remote sensing at various contest in the network procedure. points in the network are explored. The desig points in the network are explored. The design procedure was applied to the State of Colorado and a water quality monitoring system was developed for the Water Pollution Control Divi-sion of the Colorado Department of Health. Finan-cial and manpower constraints were considered in the design. (EPA) W73-13024

ENVIRONMENTAL PROTECTION THROUGH PUBLIC AND PRIVATE DEVELOPMENT CON-

ennsylvania Univ., Philadelphia. Inst. for En-

ental Studies

vironmental Studies.
A. L. Strong, and J. C. Keene.
Copy available from GPO Sup Doc as
EPI.23/3-73-018, \$2.10; microfiche from NTIS as
PB-222 587, \$1.45. Environmental Protection
Agency, Socioeconomic Studies Series Report,
EPA-R5-73-018, May 1973. 116 p, 18 tab, 14 ref.
EPA Project 16110 EDC.

Descriptors: *Attitudes, *Community development, Easements, Land tenure, Leases, Scenic easements, Zoning, Land use, *Land development, *Protection.

Identifiers: *Land use controls, Development corporations, Conservation easements, *Brandywine

The studies described are an integral part of a much larger study of land management for pur-poses of water resource protection. The larger study is popularly known as the 'Brandywine Pro-ject.' The research is classified into three principal ject. The research is classified into three principal categories: (1) research directly related to the Brandywine Project; (2) investigation of public regulatory and less than fee controls on development; and (3) shaping of the concept of a private development corporation. The research approach is predominantly legal and governmental. In all instances in which information is available, citizen response to the various development controls has been examined and is included in the research rerts. The research conclusion is that greater use of large-scale public and private control of land opment can not only contribute significantly to water resource protection but will also increase private benefits. Increasing use of these forms of controls is predicted despite a substantial amount of opposition from private landowners. (EPA) W75-13025

A PROTOTYPE HIGH SEAS OIL RECOVERY SYSTEM: PHASE I-SYSTEM DEVELOPMENT, VOL. III.

Lockheed Missiles and Space Co., Sunnyvale,

W. T. Beran, B. Bruch, and K. R. Maxwell. Available NTIS, Springfield, Va 22151 as AD-758
353, Price \$3.00 printed copy; \$1.45 microfiche.
Coast Guard Office of Research and Development Final Project Report 724103.06.3, February 1972.

Descriptors: *Oil spills, *Water pollution sources, *Pollution abatement, Methodology, Research and development, Water pollution control, Oil pollution, Ecology.

Identifiers: *Oil spill recovery.

Results are presented on the preliminary design and development of a high seas oil spill recovery system. Included are (1) tests of a unique oil recovery device, (2) scaling relationships for oil recovery, and (3) preliminary design of an oil recovery system. The oil recovery device consists of a series of vertical discs held in position by horizontal vanes which are attached on the disc peripheries. A stationary hollow trough is mounted through the center of the disc-vane assembly. Between the discs and attached to the top of the shaft are wipers. The discs, immersed less than their radius, rotate through the oil-water liquid to effect oil recovery. Calm water tests were made for 4-, 6-, and 8-ft devices in various oils and slick thicknesses. Results are also given for a 1/9-scale model of an 8-ft diameter device tested in a tow basin. Analyses include attempts to develop mathematical models of the recovery process, oil recovery predictions based on test data for a 4-ft diameter by 13-ft long device mounted on a catamaran, and analyses of catamaran motion response in various seaways. (Woodard-USGS)

A DECADE OF JUDICIAL DEVELOPMENTS AND CHANGES IN COLORADO WATER LAW:

1960-1970, Colorado State Univ., Fort Collins. Dept. of For primary bibliographic entry see Field 06E. W73-13070

Group 5G-Water Quality Control

WATER POLLUTION: ENVIRONMENTAL IM-WATER POLITION: ENTROMBET AND MEANS OF CONTROL,
Rutgers-The State Univ., New Brunswick, N.J.
Water Resources Research Inst.
W. Whipple Jr.
Eighth Annual Henry M. Shaw Lecture, Series in

Civil Engineering, January 1973, Dept. of Civil Engineering, North Carolina State University, Raleigh, N.C., 26 p. OWRR-A-025-NJ (3).

Descriptors: *Environmental effects, Ecology, Environmental engineering, Water pollution, *Federal Water Pollution Control Act, Planning, *Water quality control. Identifiers: Water quality planning, *Environmen-

The enormous cost of projected water pollution control programs has not been justified by comprehensive planning, evaluated environmental advantages of clean water, or any scientific criteria. They are enjoined by simple rules-of-thumb and werbal criteria embodied in Federal legislation. Planning under the Water Resources Council has either not considered water quality or included arbitrarily negarated programs. Furjionmental impringing the programs of the p either not considered water quality or included arbitrarily prepared programs. Environmental impacts of future situations can only be properly evaluated if cognizance is taken of unrecorded pollution as well as recorded effluents. There is a great lack of data and of methodology of investigating environmental impacts; and the Federal Government, which should take the lead in making such investigations has present the in making such investigations, has passed the responsibility back to the states and private in-

PESTICIDES, POLLUTION, AND FOOD

Cornell Univ., Ithaca, N.Y. Dept. of Entomology.

D. Fimentei. Environ Biol. Vol 72, No 1, p 1-38. 1972. Illus. Identifiers: Apples, Birds, Cotton, Fish, *Food supply, Insects, Onion, Peach, Pest, *Pesticides, Pollution, Tobacco, Toxicity, *Insecticides.

An analysis was made of the available data on the extent of pesticides use on crop lands and losses of crops, both treated and untreated. If pesticides crops, both treated and untreated. If pesticides were not used, crop losses were estimated to increase 7% (representing \$2.1 billion). Overall, except for supplies of crops such as apples, peaches, and onions, most food crops would not be seriously affected by discontinuing use of pesticides. Only 5% of this country's total crop acres receive insecticide treatment, and about half of this is applied to cotton and tobacco acres. Despite the large increases in insecticide use, crop losses due large increases in insecticide use, crop losses due to insect pests are also increasing and are now estimated by the USDA to be nearly 13%. In part, these trends are due to the practice of substituting insecticides for sound bioenvironmental pest controls (e.g., crop rotation and sanitation) and also to higher consumer standards. Although pesticides should not be eliminated, a need exists to treat only when necessary, to reduce aircraft spray drift, and to reactivate sound bioenvironmental controls. Also, additional acreages of some crops could be profitably planted to offset crop losses due to pesticide reduction. Concerning the toxicity due to pesticide reduction. Concerning the toxicity of pesticides, the prime danger appears to be to those who apply these poisons. Unfortunately, the available data on long-term, low-level effects of pesticides to public health are inconclusive. Existing levels of pesticide pollution already have been responsible for kills of some species of beneficial insects, fishes, and birds. This serious pollution has occurred when only a small percentage of the crop acres are being treated with pesticides. A systems approach to pest management, in which the multiple factors of pests, crop culture, costs, benefits, and risks to environment and health are evaluated, is suggested as meeting the needs of agriculture and society as a whole.--Copyright 1973, Biological Abstracts, Inc. W73-13104 EFFECT OF WATER REGIME ON THE SUCROSE-ENZYME RELATIONSHIPS OF SU-SULKUSE-ENZYME RELATIONSHIPS OF SU-GARCANE DESSICATED WITH PARAQUAT, Puerto Rico Univ., Mayaguez. Agricultural Ex-periment Station. For primary bibliographic entry see Field 03F. W73-13114

POLLUTION ABATEMENT PROGRAMS IN THE DELAWARE RIVER ESTUARY, Delaware River Basin Commission, Trenton, N.J.

S. P. Gross.
In: Water - 1972, American Institute of Chemical Engineers Symposium Series No 129, Volume 69, 1973, p 414-421, 9 fig. 4 tab, 11 ref.

Descriptors: *Pollution abatement, *Delaware River Basin Commission, Delaware River, *Waste assimilative capacity, *Water quality standards, Dissolved oxygen, *Interstate commissions, Interstate rivers, *Estuaries, Water pollution control, Abatement, Biochemical oxygen demand, Effuents, Interstate compacts, Oxygen demand, Oxygen sag, Regulation, River Basin commissions, Scheduling, Tidal waters, Waste water, Waste water pollution, Waste water disposal, Waste water treatment, Water pollution sources, Water pollution treatment, Water quality, Water quality control. Identifiers: *Allocations, *Abatement schedules, Water uses, Effluent quality requirements, Compliance, Water quality zones.

The program of the Delaware River Basin Commission (DRBC) to abate pollution in the Delaware River Estuary begun in 1968, which was undertaken to implement water quality standards adopted by the Commission in 1967, is the first to utilize the concept of allocation of stream assimilative capacity. Although abatement measures for most of the nearly 100 waste sources are either in host of the fleaty for waste sources are called in the construction or planning steps, some abatement of waste discharges has occurred, and some minor improvements in stream quality have been observed. The significant features of the program scribed, as well as initial, current, a jected waste discharge characteristics and stream quality conditions. (DRBC) W73-13164

EFFECTS OF TEMPERATURE AND CHEMI-CAL TREATMENTS ON THE CHEMICAL COMPOSITION OF ALKALINE WATER,

Ministry of Agriculture, Bangkok (Thailand). Rice

P. Nammuang. Thai J Agric Sci. Vol 5, No 3, p 203-225. 1972. Identifiers: *Alkaline water, Ammonium, Calcium, Chemical composition, Hydroxides, Irrigation, Magnesium, Potassium, Salts, *Water chemistry, Water temperature, Chemical treat-

As water temperature increased from 16 to 32C, the values of Na+, K+, and pH increased while the values of HCO3-, Ca++, Mg++ and electrical conductivity (EC) decreased. The reduction of such alkaline components was small compared to the amount of bases NH4OH, KOH and Ca salts of chloride and sulfate added to the water. The additional conductions of the conduction of the dition of NH4OH without Ca salt was not as effective in precipitating HCO3- and Ca++, regardless tive in precipitating HCO3- and Ca++, regardless of temperature or concentration as was KOH. However, 500 ppm of K added at 32C was required to precipitate all of the bicarbonate. Ca salts added alone were not effective in removing bicarbonate. However, when Ca salts were added with the base at 250 ppm, the bicarbonate was completely removed. The combination of 500 ppm KOH and Ca salt was the most effective test. of KOH and Ca salt was the most effective treat-ment for removing alkalinity from the water. All the bicarbonates and most of the Ca and Mg were removed. The pH, EC, Na, K and use of NH4+ as NH4OH+ Ca salts are discussed.--Copyright 1973, Biological Abstracts, Inc. W73-13191

A LITERATURE SURVEY OF OCEAN POLLU-

TION, Catholic Univ. of America, Washington, D.C. Inst. of Ocean Science and Engineering. For primary bibliographic entry see Field 05B.

SOCIOLOGICAL CONSIDERATIONS IN IR-RIGATION WATER MANAGEMENT: FACING PROBLEMS OF WATER QUALITY CONTROL. do State Univ., Fort Collins. Colorado Si E. Vlachos.

B. Viachos.

National Conference on Managing Irrigated Agriculture to Improve Water Quality, May 16-18, 1972. Sponsored by the Environmental Protection Agency, Colorado State University. Proceedings, p 285-306, (1972). 6 fig, 3 tab, 23 ref. OWRR-B-043-COLO (7).

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Descriptors: *Irrigation water, *Social aspects, *Water management (Applied), *Water quality control, *Return flow, Water delivery, Water distribution (Applied), Water law, Social change, Irrigation efficiency, Irrigation systems, Irrigation practices, Salinity, Environmental effects, Urbanization, Institutional constraints, Water measurement.

Water quality degradation due to poor irrigation practices is being recognized in the western U.S. in a new context of socio-demographic considerations, where problems of water management, supply, utilization, reclamation, and conservation can no longer be solved without asking questions that were formerly avoided. As the largest contents of while water supplies irrigated actical. that were formerly avoided. As the largest con-sumer of public water supplies, irrigated agricul-ture in the west is now being questioned seriously by those who ask if the government should pay farmers not to till the soil in states with high rain-fall while it subsidizes farm irrigation in states with low rainfall. Any discussion of the social aspects iow raman. Any discussion of the social aspects involved in water quality management projects must deal with such questions as the future of water development projects for new irrigation, larger considerations for an understanding of agriculture in a changing society, the relationship between man, technology, society, and environment. Technical recommendations include irrigation efficiencies through water measurement; modification of long-established local customs of water delivery and use; evaluation of methods of treatment of soil salts; a water charge schedule that will make the farmer cognizant of the need for good irrigation practices; and modernization of project facilities such as turnouts and canal linings. (Paylore-Arizona) W73-13307

WATER PURIFYING APPARATUS, For primary bibliographic entry see Field 05D. W73-13326

LIQUID FILTERING APPARATUS, For primary bibliographic entry see Field 05D. W73-13327

FLEXIBLE OIL BOOM FOR HIGH SEA, Hurum Shipping and Trading Co. Ltd., Montreal (Quebec). (assignee)

(Value), lassified; R. A. Fossberg, U.S. Patent No. 3,740,955, 4 p, 4 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 911, No 4, p 1189, June 26, 1973.

Descriptors: *Patents, *Oil spills, *Oil pollution, *Pollution abatement, Equipment, Water pollution control, Water quality control. Identifiers: *Oil booms.

A curtain of sheet material is deployed in a vertical position. Its upper portion is above water with the lower below the water surface. Stiffening members are arranged in opposed pairs with the curtain wall sandwiched between them. Outriggers are at-

Water Quality Control—Group 5G

tached to each side of the boom a short distance below the water line. Outriggers and stiffening members are connected in a pivotal manner. The outer end of each outrigger has means for attaching a float. A restraining device allows the outrigger to swing between a downward retracted position adjacent to the stiffener and an operating position perpendicular to the stiffener. Keels or sea anchors are held so they can swing between an upper retracted position adjacent the curtain wall and an inclined operating position. The flexible boom system is provided with exceptional stability so that it will remain in place even during very rough seas. The curtain wall, preferably made of a synthetic fabric such as nylon, can be coated with a substance such as polyvinyl chloride. Both stiffeners and outriggers are formed of aluminum. The fabric of the keel should be an extension of the curtain wall fabric. (Sinha-OEIS) W73-13331

DEVICE FOR FENCING AND ABSORBING CONTAMINATING OIL SPILLS ON WATER, Johns-Manville Corp., New York. (assignee)

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T. O. Bogosian. U.S. Patent No. 3,739,913, 4 p, 8 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 911, No 3, p 903, June 19, 1973.

Descriptors: *Patents, *Oil spills, *Oil pollution, Equipment, *Pollution abatement, Water pollution control, Water quality control.

An elongate open-mesh container is used to surround an oil spill. The contents of the container consists of a mass of fibrous oil-absorbing material. The material may be a mixture of glass fibers and cord reclaimed from used tires by a process of stredding and separation of the cord from the rubber matrix. The flotation material should consist essentially of expanded polystyrene. A rope extends through the center of the container and through all containers linked thereby. (Sinha-OEIS)

APPARATUS FOR ELIMINATING OIL SLICKS FROM LARGE BODIES OF WATER, F. P. Donsbach.

U.S. Patent No. 3,741,391, 4 p, 4 fig, 12 ref; Official Gazette of the United States Patent Office, Vol 911, No 4, p 1300, June 26, 1973.

Descriptors: *Patents, *Skimming, *Oil spills, *Oil pollution, *Pollution abatement, Equipment, Water pollution control, Water quality control.

Water containing an oil slick is drawn into and contained within a large tub shaped vessel. Within the vessel the lighter contaminating liquid can be drawn off at the top while the clean water is pumped away from the lower level. In the bottom of the vessel, a tubular sleeve is arranged, to which is attached laterally a conveying system which sucks off the water from the confined controlling entrance and exit is provided. Special arms are attached to the vessel and to floats which support the entire device. A floatable ring is capable of limited vertical and angular movement with respect to the remainder of the vessel so that it may assume a middle position between the two liquid levels inside and outside the space until the liquid that is to be eliminated and some water will flow in the space across the upper edge. As soon as the layer of liquid to be eliminated is so thick in the confined space that there is no longer any danger that water will be sucked from the confined space the pumping system is turned on. (Sinha-OEIS)

CLOGGING IN SIMULATED GLACIAL AQUIFERS DUE TO ARTIFICIAL RECHARGE, Illinois Univ., Chicago. Dept. of Geological Sciences.
For primary bibliographic entry see Field 04B. W73-13374

LEPTOMITUS LACTEUS (PHYCOMYCETES, OOMYCETALES, SAPROLEGNIACEAE) AS FOOD FOR COOT (FULICA ATRA) AT ARTIFICIAL POND OF DANUBE NEAR OEPFINGEN, (IN GERMAN), 1. Hosbitages,

J. Hoelzinger.

Anz Ornithol Ges Bayern. Vol 11, No 2, p 168-175.

Anz Orminio Ges Bayerin. Vol 11, NO 2, p 168-17.
1972. Illus. English summary.
Identifiers: Artificial ponds, "Coots, Danube, Fulica-Atra, Green-winged teal, Leptomitus-Lacteus, Domycetales, Phycomycetes, Ponds, Saprolegniaceae, Sphaerotilus-Natans, "Germany (Oepfingen), "Aquatic fungi, Waterbird diets.

In the winter of 1971-1972, coots were observed in an artificial pond in Oepfingen (16 km West of Ulm, West Germany) feeding almost exclusively on the aquatic fungus L. lacteus. Waste water drained from a factory into the Danube 8 km away. The contaminated river water fed the pond and resulted in an intensive bloom of Leptomitus. The fungus attaches itself to objects, but is later broken off by the force of the stream and washed into the pond where it sinks to the bottom in great quantities. Greatest productivity of Leptomitus was always between Nov. and March, at which time coots appeared in great numbers, up to as many as 6320. It is presumed that other water birds also feed on this fungus. Very probably flocks of green-winged teal feed on the aquatic bacterium Sphaerotilus natans, which also blooms in great quantities following the waste water introduction mostly in autumn and spring.—Copyright 1973, Biological Abstracts, Inc. 1972. 1733

ADSORBING AND ADHESIVE MATERIALS FOR VIRUS REMOVAL FROM WATER, (IN RUSSIAN), For primary bibliographic entry see Field 05F. W73-13389

RADIOACTIVE WASTE MANAGEMENT - A BIBLIOGRAPHY OF PUBLICLY AVAILABLE LITERATURE PERTAINING TO THE USAEC'S HANFORD, WASHINGTON PRODUCTION STEE

Technical Information Center (AEC), Oak Ridge, Tenn. For primary bibliographic entry see Field 05B. W73-13414

ENERGY IMPLICATIONS OF SEVERAL EN-VIRONMENTAL QUALITY STRATEGIES, Oak Ridge National Lab., Tenn.

E. Hirst. Available from NTIS, Springfield, Va., as ORNL-NSF-EP-53; \$4.00 in paper copy, \$1.45 in microfiche. Report ORNL-NSF-EP-53, July 1973. 31 p, 2 fig., 9 tab, 49 ref.

Descriptors: *Energy conservation, *Environmental effects, Energy, *Environmental engineering, Environmental sanitation, Waste water treatment, Thermal pollution, Air pollution, Cooling towers, Cost-benefit analysis, Urban sociology, Pollution battement, Costs, Tertiary treatment, Sewage treatment, Estuarine environment, *Water quality control.

The energy needed to operate fairly stringent environmental protection systems is small relative to total energy use and could be offset by improvements in energy-use efficiency that are indicated. Based on 1970 data, costs of hypothetical systems were: (1) urban passenger traffic (improved emis-

sion control offset by automobile redesign and a 10% shift to mass transil), 0.47% net decrease in total U.S. energy consumption; (2) secondary-level sewage treatment, 0.43% increase; (3) solid-waste management (landfalls offset by incineration-power utilization and by recycle benefits), 0.97% net decrease; (4) air-pollution control at stationary sources), 1.25% increase; (5) dissipation of power-plant waste heat by cooling towers, 0.24% increase. To minimize piping and pumping in waste water treatment, a small plant (30,000 population equivalents) was assumed. Tertiary treatment is considered unlikely, and costs of water treatment are not included in this breakdown. Secondary treatment may allow marine-life survival and reduce algae growth. (Bopp-ORNL) W73-13421

WATER TREATMENT FOR HIGH PRESSURE BOILERS,

For primary bibliographic entry see Field 03F. W73-13440

PREOPERATIONAL CLEANING OF HIGH PRESSURE STEAM SYSTEMS, Black and Veatch, Kansas City, Mo. For primary bibliographic entry see Field 03E. W73.13446.

TEMPERATURE PROFILES IN CONDENSERS, Oklahoma State Univ., Stillwater. For primary bibliographic entry see Field 03E. W73-13445

HEATING AND COOLING IN BATCH PROCESSES, Proctor and Gamble Co., Cincinnati, Ohio. T. R. Brown. Chemical Engineering, Vol 80, No 12, p. 99-104, May 28, 1973. 4 fig

Descriptors: *Design criteria, *Heat transfer, *Mathematical studies, *Temperature, Heating, Cooling, Mechanical engineering, Design, Facilities, Equipment, Heat exchangers, Equations, Time, Heat load, Flow rates, Optimization.

A good understanding of heating and cooling operations of batch processes can minimize the number of design and start-up problems. Several easy-to-use equations are presented for cases in which there is a change of phase in the heat transfer medium and in which there is no change of phase in the transfer medium. These relations allow the following quantities to be calculated as a function of time: (1) batch temperature, (2) heat load or rate of transfer, (3) flowrate for a medium that changes phase, and (4) return or final temperature for the medium that does not change. Some typical design and start-up problems which can occur without this knowledge are discussed, such as insufficient process capacity, insufficient plant-utility capacity, high-cost designs, excessive flowrate of the heat transfer liquid and poor start ups. The important relations presented are: temperature and time; heat load and time; medium flow rate and time; and medium outlet temperature and time; heat load and time; medium flow rate and time; and medium outlet temperature and time; period of time, which is ideal for the study of alternates and for system optimization. (Jerome-Vanderbill)

SIMPLIFIED METHOD FOR DETERMINING TOWER DRIFT RATE, For primary bibliographic entry see Field 05B.

Group 5G-Water Quality Control

IRRIGATION MANAGEMENT FOR CONTROL OF QUALITY OF IRRIGATION RETURN

Utah State Univ., Logan. Dept. of Agricultural

and Irrigation Engineering.
L. G. King, and R. J. Hanks.
Copy available from GPO Sup Doc as
EP1.23/2:73-265, \$3.45; microfiche from NTIS as PB-222 773, \$1.45. Environmental Protection Agency, Technology Series Report EPA-R2-73-265, June 1973. 307 p, 81 fig, 60 tab, 75 ref. EPA Project 13030 FDJ.

Descriptors: "Return flow, "Leaching, "Salinity, "Irrigation practices, "Colorado River Basin, Environmental effects, Water quality, Irrigation, Drainage, Soil water, Management, Drainage effects, Computer models, "Model studies, "Utah. Identifiers: Return flow quality, On-farm water management, Salt storage, Irrigation scheduling, Salt movement, Irrigation frequency, Irrigation management, Field irrigation studies, Ashley Valley (Utah).

Field studies tested the possibilities for using the unsaturated soil profile including the crop root zone as a temporary salt reservoir and providing excess water for leaching and salt discharge when desired. Two models were developed for describ-ing flow of water and salt through the soil with extraction of water by evapotranspiration. One model was designed for use as an irrigation management tool while the other model was initially intended to provide a detailed understanding of the water and salt flow through the soil. The best management model will probably result from a combination of the two models described. Timing of irrigation was tested as a management variable. With all other conditions the same, the model predicts that as the time interval between irrigations increases, the season totals of salt removed from the root zone, salt remaining in the profile, and water required for leaching tend to level off. However, the irrigation frequency has a signifi-cant effect upon when the salt is discharged during the season. Results indicate that manag tion for control of return flow quality requires good control of depth and timing of irrigation. Some needs for further research are given. (EPA)

SELECTED IRRIGATION RETURN FLOW QUALITY ABSTRACTS 1970-1971, SECOND ANNUAL ISSUE, Colorado State Univ., Fort Collins. Dept of

Agricultural Engineering. G. V. Skogerboe, W. R. Walker, D. J. Meyer, and R. S. Bennett.

Copy available from GPO Sup Doc as EPI.23/2:73-271, \$3.20; microfiche from NTIS as PB-222 796, \$1.45. Environmental Protection Agency, Technology Series Report, EPA-R2-73-271, June 1973. 285 p. EPA Project 13030 FVN.

Descriptors: *Fertilizers, Irrigated land, Irrigated systems, *Irrigation water, *Nitrates, systems, *Irrigation water, *Nitrates, *Phosphates, *Return flow, Salinity, Water pollution effects, Water pollution sources, Water quality control, Abstracts, *Bibliographies.

Research related to the quality of irrigation return flow is being conducted at numerous institutions throughout the western United States. Related work is also underway at other institutions in the United States, as well as other portions of the world. Approximately 100 sources of material have been searched for articles pertinent to the National Irrigation Return Flow Research and Development Program. These articles describe water quality problems resulting from irrigated agriculture, potential technological solutions for controlling return flows, recent research pertinent to return flow investigations, and literature as-sociated with institutional constraints in irrigation return flow quality control. This second annual issue of SELECTED IRRIGATION RETURN

FLOW QUALITY ABSTRACTS contains approximately 450 abstracts of documents published in 1970 and 1971. Author and subject indexes are ided. (EPA) W73-13472

RESEARCH NEEDS ON WASTE HEAT TRANSFER FROM LARGE SOURCES INTO THE ENVIRONMENT.
Illinois State Water Survey, Urbana.

December 1971. 37 p. GI-30971.

Descriptors: "Thermal powerplants, "Thermal pollution, "Environmental effects, "Heat transfer, Research and development, Electric power production, Heated water, Discharge (Water), Wastes, Cooling towers, Ponds, Lakes, Rivers, Biology, Biological community, Atmosphere, Meteorology, Evaluation, Technology, Management.

The data discussed and the findings and recom-mendations of a conference held at Zion, Illinois mendations of a conference held at Zion, Illinois on September 20-24, 1971 are presented. A group of 27 experts from a broad cross-section of professional activities reviewed the knowledge of present and projected environmental effects resulting from large injections of waste heat into the environment by means of cooling towers, cooling ponds, lakes, and streams. Areas of research priority determined were: the social and economic pressures related to the installation of new technology; the biological consequences of the set. chnology; the biological consequences of th dition of waste heat to the environment; the effects of additional heat on atmospheric conditions; the establishment of effective predictive methods for the hydrological conditions brought on by the discharge of waste heat; and the technological developments which have recently occurred. Ways to achieve management and coordination of ways to achieve management and coordination of research efforts were presented. The need for ad-ditional environmental data, a clearing house for coordination of the data, education of the public, and interdisciplinary team research were emphasized. (Jerome - Vanderbilt) emphasized W73-13473

ENVIRONMENTAL LEGISLATION: HOW IT AFFECTS FOSSIL-FUEL-FIRED POWER-GENERATING EQUIPMENT, General Electric Co., Schemectady, N.Y. For primary bibliographic entry see Field 06E. W73-13474

UPPER MISSISSIPPI RIVER COMPREHENSIV BASIN STUDY, APPENDIX H--WATER SUPPLY AND QUALITY CONTROL. Federal Water Quality Administration, Chicago, Ill. Great Lakes Region. For primary bibliographic entry see Field 06B. W73-13488

ESTABLISHMENT OF INVERTEBRATE COM-MUNITIES ON LOG SUBSTRATES IN THE MINITES ON LOG SUBSTRATES IN KASKASKIA RIVER, ILLINOIS, Illinois State Natural History Survey, Urbana. For primary bibliographic entry see Field 05C. W73-13508

MAINTENANCE OF GREAT SOUTH BAY AND PATCHOGUE RIVER, NEW YORK, NAVIGATION PROJECT (FINAL ENVIRONMENTAL STATEMENT).

Army Engineer District, New York. For primary bibliographic entry see Field 08B. W73-13524

THE PRESIDENT'S 1973 ENVIRONMENTAL Council on Environmental Quality, Washington,

For primary bibliographic entry see Field 06G. W73-13528

TREATMENT OF ACID MINE WATERS, Rohn and Haas Co., Philadelphia, Pa. For primary bibliographic entry see Field 05F. W73-13349

AN OVERVIEW OF WATER MANAGEMENT Greeley and Hansen, Chicago, Ill. C. W. Reh. Journal Water Pollution Control Federation, Vol 43, No 12, p 2331-2337, Dec. 1971.

Descriptors: *Water resources, *Managem Public relations, Financing, Water quality control, Administration, Water management (Applied).

Five main problem areas associated with water rive main problem areas associated with water resource management are discussed. Public de-mand problems center attention on reaction to available information and the resulting greater awareness of the public. Alternatives lead to problems of the decision-making process, while other problems stem from the new attention given other problems stem from the new attention given the persons who have quietly pursued the task of managing the environment. The remaining problems include financing – how to fund and allocate needed projects; and organization – determining which governmental branch should take the responsibility in matters concerning water quality control. (Bean-AWWARF)

BEHAVIOR OF DETERGENTS (ABS), BACTERIA, AND DISSOLVED SOLIDS IN WATER-SATURATED SOILS, Geological Survey, Denver, Colo. For primary bibliographic entry see Field 05B. W73-13560

WATER REQUIREMENTS OF THE PETROLE-UM REFINING INDUSTRY, Maryland Univ., College Park. For primary bibliographic entry see Field 03E.

PRELIMINARY REPORT ON THE DISPOSAL PRELIMINARY REPORT ON THE DISPOSAL OF OIL-FIELD BRINES IN THE RITZ-CANTON OIL FIELD, MCPHERSON COUNTY, KANSAS, Bureau of Mines, Bartlesville, Okla. Petroleum Experiment Station.
C. J. Wilhelm, and L. Schmidt.
U.S. Bureau of Mines Report of Investigations No 3297, December 1935. 20 p, 15 ref.

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Descriptors: *Brine disposal, Waste water disposal, *Injection wells, Streamflow, Chlorides, *Saline water intrusion, *Kansas. Identifiers: *Petroleum industry, Dilution, Disposal in streams, *Salt water reservoirs.

The return of brines to their original subsurface The return of brines to their original subsurface formations is one of the methods by which positive disposal of brine is accomplished. Subsurface disposal is not always possible because of various difficulties encountered, but it is thought that where the formation has porous streaks large volumes of brine may be returned successfully upon proper preparation. It was found that all wells drilled for oil or gas in the test area should be completely cemented in order to prevent possible future contamination. Tests to determine the of future contamination. Tests to determine the effects of back pressure on wells producing large volumes of salt water were recommended. Con-trolled dilution of brine by dumping into surface streams was seen as a disposal possibility for a part of the brine production in the area studied. (Campbell-NWWA) W73-13564

Techniques of Planning—Group 6A

DESIGN OF CASINGS AND SCREENS FOR WATER PRODUCTION AND INJECTION

Moss (Roscoe) Co., Los Angeles, Calif. For primary bibliographic entry see Field 08B. W73-13568

A CHEMICAL APPROACH TO THE PROBLEM OF ENVIRONMENTAL CONTAMINATION, For primary bibliographic entry see Field 06G. W73-13586

SOLUTE SEPARATION BY CONTINUOUS BUB-

BLE FRACTIONATION, Rutgers - The State Univ., New Brunswick, N.J. For primary bibliographic entry see Field 05D. W73-13638

CONTINUOUS BUBBLE FRACTIONATION: PART I, THEORETICAL CONSIDERATION, Calspan Corp., Buffalo, N.Y. For primary bibliographic entry see Field 05D. W73-13639

CONTINUOUS BUBBLE FRACTIONATION: PART II, EFFECTS OF BUBBLE SIZE AND GAS

RATE, Calspan Corp., Buffalo, N.Y. For primary bibliographic entry see Field 05D. W73-13640

CONTINUOUS BUBBLE FRACTIONATION: PART III, EXPERIMENTAL EVALUATION OF FLOW PARAMETERS, Calspan Corp., Buffalo, N.Y.

For primary bibliographic entry see Field 05D. W73-13641

EVALUATION AND DEVELOPMENT OF PHYSICAL-CHEMICAL TECHNIQUES FOR THE SEPARATION OF EMULSIFIED OIL FROM WATER,

Calspan Corp., Buffalo, N.Y. For primary bibliographic entry see Field 05D. W73-13642

AN ACT PROHIBITING THE POLLUTION DISCOLORATION, CONTAMINATION, DISCOLORATION, CONTAMINATION, CLOGGING, OR DIVERSION OF PUBLIC

For primary bibliographic entry see Field 06E. W73-13650

06. WATER RESOURCES PLANNING

6A. Techniques of Planning

ATTITUDES OF RIPARIANS TOWARDS THEIR LAKE ENVIRONMENTS: A STUDY OF LAKE WYOLA AND DAMON POND, MAS WYOLA AND DAMON POND, MAS-SACHUSETTS, Massachusetts Univ., Amherst. Dept. of Land-

scape Architecture.
J. H. Martin, and L. G. Wegkamp. Available from the National Technical Informa-tion Service as PB-222 485, \$3.00 in paper copy, \$1.45 in microfiche. Massachusetts Water Resources Research Center Completion Report FY-73-10, June 1973. 41 p. OWRR A-031-MASS

Descriptors: Planning, *Aesthetics, Economics, Institutions, *Massachusetts, *Lakes, Lake shores, *Recreation, Lake morphology, *Attitudes Identifiers: *Vacation homes.

This substudy hypothesized that irrespective of supply and demand, determinants exist which establish preferences for certain vacation or establish preferences for certain vacation or second home sites. Amongst these preferences are: proximity to unpolluted water with recreation potentials; a non-urban setting, preferably a wilderness area accessible to the permanent home location; a setting of some natural beauty with a combination of vegetative and topographical variety. Two lakes were selected to test the first variable, taking care to ensure all the other variables were held constant. The study found that (a) considerable recreational limitations occurred on the polluted lake due to physical and psychological factors (b) respondants were adverse to admitting factors (b) respondants were adverse to admitting that water was polluted and in any event discounted the deleterious environment effects of discounted the deleterious environment effects of polluted water (c) configuration of shoreline, topography, orientation and access were noted as determinants of house location (d) morphology of water body interaction of shore configuration and water surface suggests important locational determinants and stimuli for community growth (e) building condition and building location are not necessarily functions of supply and economic factors.

DETERMINATION OF OPTIMAL MULTIPLE USES OF A SMALL WATER RESOURCE, Massachusetts Univ., Amherst. Water Resources

Research Center.

Research Center.
C. A. Carlozzi, W. Bellows, P. J. Godfrey, J. C. Mawson, and J. R. Vilkitis.
Available from the National Technical Information Service as PB-222 524, \$5.25 in paper copy, \$1.45 in microfiche. Completion Report FY73-8, May 1973. 168 p, 10 fig. 34 tab, 120 ref. OWRR B-004MASS (7). 14-01-0001-1510.

Descriptors: *Optimal development plans, Water pollution, Industrial water, Ecology, Invertebrates, *Benthos, System analysis, *Input-out-put analysis, *Widdlife, *Watershed management, *Massachusetts, Water demand, Statistical methods, *Computer programs, Vegetation, Biotal Identifiers: *Millers River Watershed (Mass), Connecticut River (Mass), Diversity indices, Factors and the second and th

SYMAP, a computer graphic program for data storage and retrieval with a map print out was tested for its applicability in planning. The study area chosen was the Millers River Watershed. A number of sub-problems were studied including overall economics; the economics of the wood was a contract of the wood was a contr overall economics; the economics of the wood using industries; industrial and municipal water use; the effects of pollution on aquatic biota; the role of vegetation and vegetation management as seen by the wildlife manager; and the aesthetic-cultural characteristics of land and water use. The analysis of the role of vegetation and vegetation management involved the only effort to directly use SYMP. The results of the study of aquatic biotal representations of the study of aquatic processing the process of the study of aquatic processing the process of the study of aquatic processing the process of the study of aquatic processing processing the process of the study of a process of the study of a process of the study of the s use STMP. The results of the study of aquatic biota produced a new program, DIVERSE, which promises to have application in the analyses of mixed species populations. In an adaptation of input-output analysis, water demand was demon-strated to be a predictable function of output data. W72 12002

REGIONAL WATER RESOURCE PLANNING FOR URBAN NEEDS: PART II (APPENDICES), North Carolina Univ., Chapel Hill. Dept. of City and Regional Planning. D. H. Moreau, K. Elfers, S. Nicolson, and K. Tekanebi.

Takeuchi North Carolina Water Resources Research Institute, Raleigh Report No 77 (UNC-WRRI-73-77), March 1973. 88 p. OWRR B-021-NC (3) and B-045-NC (2). 14-31-0001-3313. 14-31-0001-3624.

Descriptors: *Planning, *Alternative planning, *Water supply, *Water pollution control, Regional analysis, Model studies, Simulation analysis, Methodology, Optimization, Inter-basin transfers. Identifiers: *Urban water resources.

Appendices including methodology used in employment projections, water resource simulation model, optimal control of multi-unit inter-basin water resource systems, statistics and models of streamflow, and water quality model. (See also W73-07819) W73-13015

A PROCEDURE FOR ASSESSING WATER RESOURCES FOR URBAN PLANNING, Geological Survey, Washington, D.C. D. A. Rickert, W. J. Schneider, and A. M. Spieker. Water Resources Bulletin, Vol 9, No 4, p 768-792, August 1073, 3 for 3 for 5 for 5 for 795. August 1973. 3 fig, 3 tab, 3 ref.

Descriptors: Water resources development, *Data collections, *Planning, *Urbanization, *Hydrologic data, *City planning, Water management (Applied), Urban hydrology, Runoff, Low flow, Peak discharge, Urban runoff, Groundwater, Hydrogeology, Water supply.

Identifiers: *Urban planning.

A data-organization chart in the form of a matrix may be used to guide the assessment of urban water resources. The matrix provides a means for determining the relative importance of water-related problems, and for identifying the data needed to evaluate these problems for the purpose of urban planning. The matrix columns list nine categories of potential water-related urban problems. The rows list 51 categories of data inputs which may be needed to evaluate the potential problems. The inputs include standard types of basic hydrologic data, information based on analysis and interpretation of these data, and information on the interfacing factors of climate, land, and culture. A system is described for ranking the relative importance of the problem categories and data tive importance of the problem categories and data inputs on a numerical scale of 0 to 3. From this, an index is derived that evaluates the relative imindex is derived that evaluates the relative importance of each input item to an overall program for water resource assessment. From the completed matrix the hydrologist can determine the availability of data to meet the identified requirements. Judgement can then be made as to priorities on work elements to provide the planner with maximum information in minimum time. The matrix also provides a basis for the development of programs and their funding in order to ov come critical data deficiencies. (Knapp-USGS) W73-13035

THE COASTAL ZONE AS AN INTEGRAL ELE-MENT OF WATER-RESOURCE SYSTEMS, Florida State Univ., Tallahassee. Dept. of Urban and Regional Planning. For primary bibliographic entry see Field 02L. W73-13036

PROBLEMS IN STOCHASTIC SOME HYDROLOGY,
Texas Univ., Austin. Center for Research in Water Resources. For primary bibliographic entry see Field 02A. W73-13039

A MINIMUM COST WATER DISTRIBUTION

NETWORK,
Michigan Univ., Ann Arbor. Dept. of Environmental and Industrial Health.
For primary bibliographic entry see Field 04A.
W73-13071

DESIGN OF OPTIMAL WATER DISTRIBUTION NETWORKS USING DYNAMIC PRO-NETWORKS GRAMMING.

Michigan Univ., Ann Arbor. Dept. of Environ-mental and Industrial Health. For primary bibliographic entry see Field 04A. W73-13072

Field 06-WATER RESOURCES PLANNING

Group 6A-Techniques of Planning

AN INTERACTIVE DESIGN SYSTEM FOR WATER DISTRIBUTION NETWORKS,
Michigan Univ., Ann Arbor. Dept. of Environmental and Industrial Health.
For primary bibliographic entry see Field 04A.
W73-13073

A STOCHASTIC MODEL FOR THE OCCUR-RENCE OF MOISTURE IN VADOSE MEDIA, Clemson Univ., S.C. For primary bibliographic entry see Field 02G. W73-13074

LOSS OF INFORMATION BY DISCRETIZING HYDROLOGIC SERIES, Colorado State Univ., Fort Collins. Dept. of Civil primary bibliographic entry see Field 07A.

Minnesota Univ., Minneapolis. St. Anthony Falls Hydraulic Lab. For primary bibliographic entry see Field 07C. W73-13076

INTERNATIONAL SYMPOSIUM ON UNCER-TAINTIES IN HYDROLOGIC AND WATER RESOURCE SYSTEMS, VOL. II. For primary bibliographic entry see Field 04A. W73-13134

NATURAL REGIME HYDROLOGICAL NET-WORK PLANNING, A METHODOLOGICAL DISCUSSION, Waterloo Univ. (Ontario).

S. I. Solomon. S. I. SOIGMON.
In: Proceedings (Vol. II), International Symposium on Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tucson, December 11-14, 1972. p 473-492, (1972) 3 fig,

Descriptors: *Hydrologic systems, *Networks, *Planning, *Optimization, *Dynamic pro-gramming, *Hydrologic data, Economics, Design, gramming, *Hydrologic data, Economics, Design, Costs, Benefits, Operating costs, Flow, Canada. Identifiers: Least cost, Multivariate minimization,

Presented is a method for optimizing the extension and operation of the natural regime network in areas not designated or designated for development, applied to hypothetical conditions in Canada. The methodology is based on the idea that hydrological networks consist not only of stations' the natural regime of data that hydrological networks consist not only of stations' time series of data, but also of a system of processing these data to obtain hydrological infor-mation, and time series of hydrological data at any point of the area covered by the network. The methodology consists of two distinct but related optimization processes, according to the prospec-tives of economic development of the area considered. The first process, applicable to that area not planned for development, involves determination of the main network characteristics which would optimize the network according to its interwould optimize the network according to its inter-nal objectives, such as least cost. The network ac-cording to its internal objectives, such as least cost. The technique applicable in this process is the multi-variate minimization by steepest descent method. The second optimization technique used, method. The second optimization technique used, dynamic programming, is applicable to planning the natural regime network in which development is foreseen. This planning requires a forecast of the economic development and relationships between the errors of estimate of the hydrological between the errors of estimate of the hydrological characteristics and the losses incurred in the developments envisaged. Obtained is the optimum variation of network characteristics which would produce the largest benefit. (See also W73-13134) (Bell-Cornell) W73-13134 W73-13136

THE LINEAR DECISION RULE IN RESERVOIR MANAGEMENT AND DESIGN, 3, DIRECT CAPACITY DETERMINATION AND INTRASEASON CONSTRAINTS, Johns Hopkins Univ., Baltimore, Md. For primary bibliographic entry see Field 04A. W73-13138

MODELLING THE REGULATION OF LAKE SUPERIOR UNDER UNCERTAINTY OF FU-TURE WATER SUPPLIES, Sun Oil Co., Dallas, Tex. For primary bibliographic entry see Field 04A. W73-13140

DESIGN OF EXPERIMENTS FOR ESTIMATING PROCESS DYNAMICS, Queen's Univ., Kingston (Ontario). Dept. of Mathematics. For primary bibliographic entry see Field 04A. W73-13147

THE IMPACT OF WATER RESOURCES ON THE LOCATION OF ECONOMIC ACTIVITIES, Technische Hochschule, Munich (West Germany). For primary bibliographic entry see Field 06D.

SUBJECTIVE PLANNING: A MODEL FOR WATER RESOURCE DEVELOPMENT, General Telephone Co. of the Southwest, San Angelo, Tex. T. C. Erskine, and C. S. Shih.

In: Proceedings (Vol. II), International Symposium on Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tucson, December 11-14, 1972. p 714-728, (1972). 6

Descriptors: "Water resources development, "Planning, "Decision making, "Optimum develop-ment plans, Methodology, Water supply, Mu-nicipal water, Model studies, "Texas. Identifiers: "Urban water resources, "Bayesian me

Presented is an analysis for optimum decisionmaking based on utility concepts to form an adaptive procedure for the planning and control of
urban water resources. Decision and utility theory
have the ability to evaluate unquantifiable factors
or concepts. Employment of this logical decision
procedure is very adaptable to environmental
problems. These concepts attempt to include intagible factors relevant in the evaluation of alternatives in addition to monetary considerations,
such as cost and profit. A method is given for
determining a consensus of group opinion and its
application within the framework of decision
theory. The decision analysis technique is appropriate for problems of municipalities in arid regions. A procedure is presented for the use of subjective data in a decision situation related to urban
water resource development. This is accomplished
by developing a utility function for available courses of action and evaluating these in a logical and
systematic manner. This approach to decision
making is then applied, using a method for obtainman group consensus, to the planning and water systematic manner. Into approach to decision making is then applied, using a method for obtaining a group consensus, to the planning and water resource development problems confronting San Angelo, Texas, a city suffering from recurring problems in obtaining an adequate water supply. (See also W73-13134) (Bell-Cornell)

PROBLEMS OF WATER RESOURCE DEVELOPMENT IN THE GULF COAST DEVELOPMENT IN THE GULF COAST ESTUARINE ZONE, Forest Service (USDA), New Orleans, La. Southern Forest Experiment Station. For primary bibliographic entry see Field 02L. W73-13152 SOME POSSIBLE CHANGES IN FUTURE SO-CIAL VALUES AND PRIORITIES: STRATEGIC IMPLICATIONS FOR WATER RESOURCES PLANNING, Institute for Water Resources (Army), Alexandria, For primary bibliographic entry see Field 06B. W73-13153

A REPORT ON CORPS OF ENGINEERS RESEARCH ON THE MANAGEMENT OF UNCERTAINTY IN WATER RESOURCES PLANNING, Decision Sciences Corp., Jenkintown, Pa. For primary bibliographic entry see Field 06B. W73-13155

RELIABILITY: A NEW PARAMETER IN URBAN WATER QUALITY MANAGEMENT, Texas A and M Univ., College Station. Dept. of Industrial Engineering.
For primary bibliographic entry see Field 05D.
W73-13156

DRY FARMING: UNCERTAINTY IN LAND AND WATER PRODUCTIVITY, Arizona Univ., Tucson. For primary bibliographic entry see Field 03F. For primary W73-13160

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OPTIMAL DESIGN STRATEGY FOR SMALL OPTIMAL DESIGN STRUCTURES, Queen's Univ., Kingston (Ontario). For primary bibliographic entry see Field 08B. W73-13161

THE SENSITIVITY OF RETURN PERIODS TO THE SENSITIVITY OF RETURN PERIODS TO VARIATIONS IN RETENTION LEVELS FOR DIFFERENT DEFINITIONS OF SHORTAGE, Lancaster Univ., Bailrigg (England). For primary bibliographic entry see Field 04A. W73-13162

CONCERNING THE CALCULATION LEVEL VERIATION OF CUTOFF WAR Gruzinskii Nauchno-Issledovatelskii Ins Gidrotekhniki i Melioratsii, Tiflis (USSR). For primary bibliographic entry see Field 04A. W73-13163

DECISION MAKING IN WATER RESOURCE ALLOCATION, Oregon State Univ., Corvallis. Dept. Anthropology. For primary bibliographic entry see Field 06B. Univ., Corvallis. Dept. of

6B. Evaluation Process

INSTITUTIONAL REQUIREMENTS FOR OP-TIMAL WATER QUALITY MANAGEMENT IN ARID URBAN AREAS, Colorado State Univ., Fort Collins. Environmental Resources Center. For primary bibliographic entry see Field 05G. W73-13002

EVALUATION OF DISCONTINUITIES IN RE-GIONAL POPULATION PROJECTIONS, Massachusetts Univ., Amherst. Dept. of Sociolo-

gy.

J. Wilkie, and E. Lee.
Available from the National Technical Information Service as PB-222 543, \$3.00 in paper copy, \$1.45 in microfiche. Massachusetts Water Resources Research Center, Completion Report No FY-73-9, June 1973. 24 p. 2 tab, append. OWRR A-024-MASS (1). 14-31-0001-3021.

Descriptors: Population, "Migration patterns, "Employment opportunities, Labor mobility, Density, Statistical methods, Regression analysis, Model studies, Community development, Social aspects, Distribution patterns, Cities, "Regional economics, Forecasting, Income distribution, Resource allocation," Human population. Identifiers: "Demography, "Urban ecology, "Outmigration, State economic areas, Level of living, Population composition, Factor analysis.

It is postulated (1) that water resource needs are importantly affected by both size and composition of population dispersion, and (2) that migration patterns are the major sources of uncertainty in predicting population change. A predictive model for migration behavior was studied. Using principle with the present analysis on migration. preuturing population change. A preductive modes for migration behavior was studied. Using principally multiple regression analysis on migration across State Economic Area boundaries in the form of out-migration rates for 1949-50, it is concluded that migration rates are a dynamic phenonemon dependent primarily on accessibility (transportation, communication, information, distance) and available opportunity (employment rates, income, amenities). However where accessibility is low (e.g., poor communication, great distance) out-migration is not significantly affected by differential opportunity. Also, accessibility variables were only effective when out-migration to nearest neighboring metropolitan area was considered. For out-migration to more distant areas, other accessibility variables were inconclusive. Finally, trait specific composition of community populations (color, age, education) was found not to effect out-migration rates; however, relative size of trait-specific groups effected out-migration not to effect out-migration rates; however, relative size of trait-specific groups effected out-migration of that group. A strong case is made for better statistical data. An appendix provides factor-analyzed characteristics with a table showing which factors may be deleted from analysis in favor of corresponding variables worth retaining. (Kaynor-Massachusetts) W73-13006

ATTITUDES, VALUES, AND PERCEPTIONS IN WATER RESOURCE DECISION-MAKING WITHIN A METROPOLITAN AREA, Massachusetts Univ., Boston. Dept. of Political

Science.
E. R. Kaynor, and I. Howards.
Available from the National Technical Information Service as PB-222 523, \$4.50 in paper copy, \$1.45 in microfiche. Massachusetts Water Resources Research Center, Publication No 29, June 1973. 147 p.; 1 map, 34 tab, 159 ref, append. OWRR B-018-MASS (1). 14-31-0001-3291.

Descriptors: Water resources development, *Decision making, *Regional analysis, *Institutional constraints, Planning, *Attitudes, Political aspects, Local governments, *Massachusetts, *Connecticut River, Urbanization, *City planning. Identifiers: Springfield-Chicopee-Holyoke Standard Metropolitan Statistical Area, Interviewing methods, Interest groups.

Two years of research are reported on the water Iwo years of research are reported on the water resource decision-making process in the Spring-field-Chicopee-Holyoke Standard Metropolitan Statistical Area (Connecticut River valley in Mas-sachusetts). Decision-making was found to be con-strained by local jurisdictional fragmentation, citizen and official lack of interest in regional water resource problems, and perceptual distor-tion of the facts relating to water resource problems and plans. Conflicts between groups with mutually incompatible interests did not ap-pear to be a significant constraint. A specific method is described for identifying 'interested and involved' participants in the decision-making process. With rough statistical correlational techniques, an apparent relationship is shown techniques, an apparent reationship is shown between respondent background characteristics (type and location of community of residence, em-ployment classification, political party affiliation, and type of specialized education) and attitudes, values, or perceptions of water resource issues. The annotated bibliography of 37 pages covers much of the relevant literature through 1969. Recommendations include more formal Recommendations include more formal metropolitanization, better water resource information dissemination, formalization of the role of consultants, maintenance of certain aspects of consumants, maintenance of certain aspects of decentralized decision-making, and better specifi-cation in environmental impact statements of the metropolitan area effects of upstream water resource programs. W73-13008

METHODOLOGY FOR ASSESSMENT OF URBAN WATER PLANNING OBJECTIVES, Texas A and M Univ., College Station. Water Resources Inst. For primary bibliographic entry see Field 03D. W73-13017

A COMPARISON OF CONSUMER'S SURPLUS AND MONOPOLY REVENUE ESTIMATES OF RECREATIONAL VALUE FOR TWO UTAH WATERFOWL MARSHES, Utah Center for Water Resources Research,

Logan. C. H. Brink.

Available from the National Technical Informa-tion Service as PB-222 544, \$4.75 in paper copy, \$1.45 in microfiche. Completion report June 1973. 153 p, 11 fig, 26 tab, 41 ref, 5 append. OWRR B-015-UTAH (1), 14-31-0001-1562.

Descriptors: Recreation, Benefits, *Recreation Descriptors: Recreation, Benefits, "Recreation demand, "Marsh management, Waterfowl, "Non-consumptive use, "Utah, Hunting, Use rates, Expenditures, Income, "Cost comparisons. Identifiers: Farmington Bay Waterfowl Management Area, Bear River Migratory Bird Refuge, Recreation benefits, "Waterfowl hunting."

Demand curves were estimated for waterfowl hunting and nonconsumptive recreational use from use rate and variable expenditure data collected at the Bear River Migratory Bird Refuge and the Farmington Bay Waterfowl Management Area during FY 1969. Consumer's surplus and Area during FY 1969. Consumer's surplus and monopoly revenue estimates were then derived from the demand functions. Adjusted estimates of consumer's surplus for waterfowl hunting amounted to \$7,260 per year at Bear River and \$11,400 per year at Farmington Bay. For nonconsumptive recreation annual consumer's surplus was estimated to be \$18,700 at Bear River and \$2,260 at Exercipators Bay. Monopolit exercipators estimated to the standard of the surplus o \$3,760 at Farmington Bay. Monopoly revenue esti-mates were between one-half and one-fourth the corresponding consumer's surplus estimates. The capitalized value (at 8% interest) of predicted annual consumer's surplus for all recreation was \$865,000 for Bear River and \$299,000 for Farmington Bay. Capitalization of the correspon monopoly revenue estimates gave \$276,900 for Bear River and \$92,100 for Farmington Bay. At 3% interest, the capitalized consumer's surplus values increase to \$4,242,000 for Bear River and \$1,184,000 for Farmington Bay, while those for monopoly revenue increase to \$1,330,000 for Bear River and \$350,000 for Farmington Bay. Consumer's surplus estimates are more valuable than monopoly revenue estimates gave \$276,900 for monopoly revenue estimates for comparison with ses included in the benefit/cost analysis of water development projects because the needed values include more than a nondiscriminating polist can extract.

A PROCEDURE FOR ASSESSING WATER RESOURCES FOR URBAN PLANNING, Geological Survey, Washington, D.C. For primary bibliographic entry see Field 06A.

THE COASTAL ZONE AS AN INTEGRAL ELE-MENT OF WATER-RESOURCE SYSTEMS, Florids State Univ., Tallahassee. Dept. of Urban and Regional Planning. For primary bibliographic entry see Field 02L. W73-13036

CHANGING TIMES FOR WATER RESEARCH AND TECHNOLOGY TRANSFER, Nebraska Univ., Lincoln. Water Resources Research Inst. Nessearch Inst.
W. Viessman, Jr., and K. E. Stork.
Water Resources Bulletin, Vol 9, No 4, p 647-654,
August 1973. 4 ref.

Descriptors: *Research and development, *Water resources research act, Environment, Ecology, Planning, Social aspects, Legal aspects, Water management (Applied). Identifiers: *Technology transfer.

In recent years, important changes have occurred in water resources research. There have been major shifts in attitudes of Congress, state legisla-tures, and the general public toward water and re-lated resource issues. Future water research and lated resource issues. Future water research and development will have to be environmentally oriented. Emphasis is shifting to research productivity. To justify research expenditures, hard facts must be produced which demonstrate payoff. Technology transfer (getting research results into the hands of users in an understandable and usable form) is gaining prominence. Research projects must be designed for total problem solution and technology transfer must be incorporated as a part of project objectives. Research must be planned and conducted to meet users' needs. Guidelines and conducted to meet users' needs. Guidelines for modern research design and technology transfer are presented. (Knapp-USGS)

PRELIMINARY STUDY OF POTENTIAL SITES FOR WATER-SUPPLY RESERVOIRS IN WEST AND SOUTHEAST ALABAMA, Geological Survey of Alabama, University. For primary bibliographic entry see Field 06D. W73-13041

INTERNATIONAL SYMPOSIUM ON UNCER-TAINTIES IN HYDROLOGIC AND WATER RESOURCE SYSTEMS, VOL. II. For primary bibliographic entry see Field 04A. W73-13134

ESTIMATING BENEFITS TO IMPROVED SEASONAL WATER SUPPLY FORECASTS: A CASE STUDY OF IRRIGATION BENEFITS, Battelle Memorial Inst., Columbus, Ohio. For primary bibliographic entry see Field 03F. W73-13143

STRATEGIC UNCERTAINTY AND THE NA-TIONAL ENVIRONMENTAL POLICY ACT, Environmental Defense Fund, East Setauket,

In: Proceedings (Vol. II), International Symposium for Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tucson, December 11-14, 1972. p 696-712, (1972). 19

Descriptors: "Water resources development, "Decision making, "Project planning, "Forecasting, Benefits, Costs, Feasibility, "Risks.

Water resource developments are traditionally designed to be of service over long periods of time, often exceeding 100 years. The time stream of benefits and costs of such projects will be influenced by many factors difficult to forecast at present, such as future demands for project out-

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puts, future importance of natural environments, and changes in institutions and policies. The un-certainty arising from the inability to forecast such future developments is termed 'strategic uncer-tainty.' Discussed is the problem of inadequate consideration of strategic uncertainty in decis consideration of strategic uncertainty in decisions concerning water resource projects, due greatly to the close relationship between project beneficiaries, federal construction agencies, and Congress, and to the lack of internal and external forces requiring these factions to do otherwise. The National Environmental Policy Act of 1969 (NEPA) is an important vehicle for forcing adequate consideration of strategic uncertainty by water resource development decision makers. Presently, Congress, state governors and agencies, and the eneral public lack the necessary expertise and general public lack the necessary expertise and resources to provide an effective independent review of proposed water resource developments. NEPA requires federal water resource develop-ment agencies to prepare and publish an objective data base on the proposed project and alternatives. (See also W73-13134) (Bell-Cornell) W73-13148 w of proposed water resource devel W73-13148

SUBJECTIVE PLANNING: A MODEL FOR WATER RESOURCE DEVELOPMENT, General Telephone Co. of the Southwest, San Angelo, Tex.
For primary bibliographic entry see Field 06A.

SOME POSSIBLE CHANGES IN FUTURE SO-CIAL VALUES AND PRIORITIES: STRATEGIC IMPLICATIONS FOR WATER RESOURCES PLANNING

Institute for Water Resources (Army), Alexandria.

G. P. Johnson.

S. F. Johnson.
In: Proceedings (Vol. II), International Symposium on Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tucson, December 11-14, 1972. p 754-769 (1972). 2 fig, 3 tab, 9 ref.

Descriptors: *Social values, *Priorities, *Water resources, *Planning, Forecasting, United States, *Risks.

Identifiers: *Delphi method, Trends, Change, Cultural evolution, Implications

Water resources planning in the United States has evolved from a limited purpose engineering func-tion into a complex multi-objective process. During the nation's early growth and development change was at a slow pace, mirroring the slowly changing structure. Today, however, change is rapid, and new and different trends emerge and rapid, and new and different terms to the can interact to produce many unprecedented variations in the social, economic, and technological environments. This potential for numerous new variations introduces uncertainties of a new and different type that can easily dominate en-gineering uncertainties associated with the design of physical works. Therefore, the water resources planner of today faces an ever-broadening set of complex issues and must deal with uncertainties of a much more profound nature than in the past. Preliminary results are presented from exploratory research to develop ways to assess the implication of potential changes in social values and priorities on water resources planning. An intuitive forecast-ing technique—the Delphi method—is employed to identify some potential concerns and priorities that may frame and define water resources requirements of the future. (See also W73-13134) requirements (Bell-Cornell)

TREATMENT OF SOME OF THE UNCERTAIN-TIES ENCOUNTERED IN THE CONDUCT OF EVALUATIONS

American Rockwell Corp., Downey, Calif. Space Div

A. D. Kazanowski.

A. D. Kazanowski.
In: Proceedings (Vol. II), International Symposium on Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tucson, December 11-14, 1972, p 771-785, (1972). 3 fig, 2 tab, 17 ref.

Descriptors: "Hydrologic systems, "Costs, "Evaluations, "Social aspects, "Technology, "Methodology, "Risks. *Cost-effectiveness, PERT techniques, Delphi method.

Guides that might be beneficial to reducing some of the uncertainty surrounding the conduct of cost-effectiveness evaluations, particularly of hydrologic systems, are identified and briefly described. The three major sources of uncertainty discussed are associated with determination of goals, selection of criteria, and identification of goals, selection to criteria, and identification of the uncertainty surrounding cost estimates. Goals for hydrologic systems should reflect both techni-cal and societal considerations. Technical con-siderations tend to be discrete and readily identifisiderations tend to be discrete and readily identifi-able, and societal goals tend to be pervasive (based on value systems) and transitory. The pervasive interrelationships of goals can be analyzed through the Delphi technique, relevance trees, or cross-purpose matrices. A methodology is described for determining confidence limits about the total pro-gram cost estimate; the procedure uses PERT-type generation of cost statistics and the characteristics of the Beta distribution. A crasn of the uncertainty of the Beta distribution. A grasp of the uncertainty inherent in a system cost estimate can be obtained through the application of PERT techniques to the innerent in a system cost estimate can be obtained through the application of PERT techniques to the cost estimates of the system elements. The 10-step standardized approach presented can provide the basic methodology for conducting cost-effectiveness evaluations of the societal systems or systems with a substantial societal impact; howcreased sensitivity and perception into the subtleties of the steps beyond that of the basic methodology. (See also W73-13134) (Bell-Cornell) W73-13154

A REPORT ON CORPS OF ENGINEERS RESEARCH ON THE MANAGEMENT OF UNCERTAINTY IN WATER RESOURCES

PLANNING,
Decision Sciences Corp., Jenkintown, Pa.
J. A. Orlando, and E. W. Weber.
In: Proceedings (Vol. II), International Symposium on Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tucson, December 11-14, 1972, p 786-800, (1972). 3 fig. 1 tab. 4 ref.

s: *Water resources, *Long-term *Methodology, Estimating, Manage-Descriptors: planning, *Methodology, Estimating, Management, *Risks.
Identifiers: Impact, Error, Monetary costs, Nonmonetary costs, Knowledge, Information.

The Army Corps of Engineers is sponsoring a number of studies for improving the long-range water resource planning techniques utilized by the water resource planning techniques utilized by the Corps' planners. One such study which develops a methodology for management of uncertainty in water resource planning is described. 'Manage-ment of uncertainty' refers to dealing with uncer-tainty in such a way as to reduce the impact of the uncertainty insofar as the consequences of planning decisions are concerned. The nature of the uncertainties and the techniques which are cur-rently being used to meet the problems resulting from the uncertainties are discussed. Then, the anfrom the uncertainties are discussed. Then, the approach being taken in this project to identify the uncertainties the planner must deal with, to deteruncertainties the planner must deal with, to deter-mine their significance, estimate the 'costs' of the uncertainties is described. Presented also are some possible methods of using available information and knowledge to reduce the impact of uncertainty in planning. In this study, the 'cost' of uncertainty includes the monetary and non-monetary cost of errors resulting from insufficient information, and

the cost of obtaining additional information. (See also W73-13134) (Bell-Cornell) W73-13155

THE MARGIN OF SAFETY FOR COMPENSATING LOSSES DUE TO UNCERTAINTIES IN HYDROLOGICAL STATISTICS, Research Inst. for Water Resources Development,

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Research inst. 10 Walls New York New Yo fig. 1 tab, 13 ref.

Descriptors: "Water management (Applied), "Projects, Hydrology, "Statistics, "Design, "Probability, Benefits, Compensation, Damages, Analytical techniques, Flood plains, Methodology, Costbenefit analysis, Simulation analysis, Mathematical models, Systems analysis, "Risks.
Identifiers: "Margin of safety, Economic losses, Flood leves. Flood levees.

A method is presented for estimating the margin of safety, by which the economic losses due to uncer-tainties caused by finite length of observation can be minimized in water management projects. Design value is available as a result of earlier ic analysis, or is specified officially. Th design probability pertaining to this value is obtained from the distribution function F/h/ estimated on the basis of the n year long record. The value pertaining to the design probability is not an exact one, but its empirical distribution can be determined using a simulation method. If the distribution F/h/ is a normal one, the expected value and standard deviation of distribution for the value and standard deviation of distribution for the value pertaining to the design probability can be found by analytical methods. A practical sample is presented and the relations existing between the magnitude of uncertainty and the level of design probability, on the one hand, and the margin of safety and the length of observation on the other, are introduced. The shorter the length of observation available, and the greater the benefits accruing from the project, of the damage averted, and further the higher the level of design probability, the wider the necessary margin of safety. (See also W73-13134) (Bell-Cornell)

POLLUTION ABATEMENT PROGRAMS IN THE DELAWARE RIVER ESTUARY, Delaware River Basin Commission, Trenton, N.J. For primary bibliographic entry see Field 05G. W73-13164

DECISION MAKING IN WATER RESOURCE ALLOCATION,

Oregon State Univ., Corvallis. Dept. of Anthropology. C. Brown, J. G. Monks, and J. R. Park. Oregon Water Resources Research Institute Completion Report, 1972. 143 p, 24 fig, 21 ref, 3 appen. OWRR-B-016-ORE (2).

Descriptors: Water resources, *Resource alloca-tion, *Decision making, *Planning, *Computer models, Data collections, *Oregon, Linear pro-gramming, Statistical models, Optimization, River basins, Political aspects, Social aspects, Economics, Watersheds (Basins), Governments, Networks, Mathematical models, Systems analysis, *Water allocation (Policy).

Identifiers: *Economizing techniques, *Willamette River basin (Ore).

A study is reported to delineate, classify and as-sess the importance and relationship of social-culsess the importance and relationship of social-cut-tural, political and economic inputs to the decision making process in water resources allocation. Standard techniques of data collection and analysis were employed throughout the investigation which studied specifically the Junction City Water Control District (JCWCD), located in the Willamette Valley, Oregon. Major sources of data were persons living within or associated with ad-ministration of JCWCD and various local, state, and federal government agency personnel. Of prime significance among study findings was the existence and interaction of different economizing techniques which actually accomplish the water resource allocation. Besides the importance of the pricing system with its economic cost benefit con-siderations, other major economizing techniques of democratic, bureaucratic and bargaining power activities were very much in evidence. A resource allocation model formulated in terms of network flows, presented problems of assigning value units to political and social inputs and changing decision criteria and was ruled impractical. A new linear programming model shown to have promise is presented. The judicial system appears to hold much promise for measuring social outcomes and could substantially improve resource allocation activities by broadening the base of benefits and costs to social and cultural values. (Bell-Cornell)

PROCEEDINGS OF CONFERENCE ON TOWARD A WATER RESOURCES RESEARCH PLAN FOR MINNESOTA.
Minnesota Univ., St. Paul. Water Resources

Research Center.
For primary bibliographic entry see Field 06E.

W73-13303

FUNCTIONAL AND PSYCHOLOGICAL IN-TEGRATION IN A RURAL COMMUNITY, Pennsylvania State Univ., University Park. Dept. of Agricultural Economics and Rural Sociology.
P. M. Byler.

M Sc Thesis, March 1973, 57 p, 23 tab, 35 ref. OWRR A-017-PA (1), 14-31-0001-3538.

*Flood-control, *Pennsylvania, *Rural sociology, Rural areas, *Psychological aspects, Social aspects, *At-titudes, Behavior.

This analysis examined the relationship between functional and psychological integration for individuals living in a rural Central Pennsylvania community. The nature of integration was subject to changes brought about by the construction of a flood-control reservoir which physically bisected the original community. Psychological integration was measured by (1) a seven item scale resulting in a mean of 94 and a variance of 422 where the lowest and highest possible values were 7 and 119 respectively (N±430) and (2) self-reported community identification. Functional solidarity scores were derived based on use of services in the institutional areas of retail trade, banking, religion and employment resulting in a mean of 1.2 where the lowest and highest values were 0 and 4 respec-tively. Self-reported identification was related positively at P<.01 with each of the four measures of functional integration and the solidarity index. Variations in functional integration were not significantly related to variations in the psychological integration scale scores. W73-13305

SOCIOLOGICAL CONSIDERATIONS IN IR-RIGATION WATER MANAGEMENT: FACING PROBLEMS OF WATER QUALITY CONTROL, Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 05G. W73-1330

UPPER MISSISSIPPI RIVER COMPREHENSIVE BASIN STUDY: VOLUME I, MAIN REPORT.

Available from UMRCBSCC, 2120 L St NW, Washington, D C 20037, Price \$4.00. Upper Missispip River Comprehensive Basin Study Coordinating Committee (UMRCBSCC), Report, Washington, D C, Vol 1 of 9 volumes, 1972. 133 p, 40 fig. 33 tab.

Descriptors: "Water resources development,
"Mississippi River basin, "Projections, Investigations, Reviews, "Evaluation, Aesthetics, Social
aspects, Climatology, Meteorology, Hydrology,
Surface waters, Groundwater, Geology, Mineralogy, Sediment transport, Water supply, Water
quality control, Flood control, Navigation,
Recreation, Fish, Wildlife, Powerplants, Agriculture, Water policy, Legal aspects, Economics,
"Project planning.

This study was prepared at field level and presents data for a framework program for the development and management of the water and related land resources of the Upper Mississippi River basin. The main report summarizes the findings of the 17 supporting appendices. The water and related land resources of the basin are ample. There are opportunities for further resource development. Conservation and development of the resources are needed if the basin is to maintain its relative position in the national economy. The relative position in the national economy. The resauve position in the national economy. The study presents the needs for water and related land resources and a framework for development of such resources. The estimated total first cost of the recommended framework for development is \$28.5 billion of which \$13.2 billion is Federal and \$15.3 billion is non-Federal. The annual investment ranges from \$31 per capita in 1980 to \$44 per capita by 2020. The current annual rate of investment is about \$27 per capita. Recommendations in-clude approval and adoption of the framework by the Federal Government and the seven basin the Federal Overnment and the seven basin states, further studies to develop details of the framework, periodic review of the framework, and continuation of the present Coordinating Committee pending organization of the Upper Mississippi River Basin Commission. (See W73-13481 thru W73-13497) (Woodard-USGS) W73-13480

UPPER MISSISSIPPI RIVER COMPREHENSIVE BASIN STUDY, APPENDIX A-HISTORY OF INVESTIGATION.

Corps of Engineers, Chicago, Ill. North Central

Vol 2 available from UMRCBSCC, 2120 L St NW. Vol 2 available from UMRCBSCC, 2120 L St NW, Washington, DC 20037 - Price \$4.50. In: Upper Mississippi River Comprehensive Basin Study Coordinating Committee (UMRCBSCC) Report, Washington, D.C., Vol 2 of 9 volumes, p A1-A61, 1970. 8 fig, 3 tab, 8 ref.

Descriptors: "Water resources development,
"Mississippi River basin, "Projections, Investigations, Reviews, Evaluation, Planning, Economics,
Legal aspects, Programs, Hydrology, Surface
waters, Groundwater, Fluvial sediments, Agriculture, Meteorology, Mineralogy, Water supply,
Water quality control, Navigation, Recreation,
Fish, Wildlife, Powerplants, Management.
Identifiers: "Upper Mississippi River basin.

The history, organization, and procedures used by the Coordinating Committee in the preparation of the Upper Mississippi River Comprehensive (Type 1) Basin Study are described. The appendix recounts the history of the study from events leading to the formation of the Coordinating Committee through the completion of the Committee Report. Many representatives of Federal and State agencies and private consultants contributed to the agencies and private consultants contributed to the study; their work assignments and tenures are listed. The main topics include history of water resource planning and development, organization

and procedures, basic resource studies, economic and legal studies, functional use studies, approach to planning, and information programs. (See also W73-13480) (Woodard-USGS) W73-13481

UPPER MISSISSIPPI RIVER COMPREHENSIVE BASIN STUDY, APPENDIX B-AESTHETIC
AND CULTURAL VALUES.

Vol 2 available from UMRCBSCC, 2120 L St NW, Washington, DC 20037 - Price \$4.50. In: Upper Mississippi River Comprehensive Basin Study Coordinating Committee (UMRCBSCC) Report, Washington, DC, Vol 2 of 9 volumes, p B1-B374, 1970.

*Water resources development, Descriptors: Mississippi River basin, "Aesthetics, "Environ-mental control, Maps, Topography, Vegetation, Surface waters, Groundwater, Wildlife, Land resources, Geology, Soil types, Land use, Water resources, Mapping, Management. Identifiers: "Upper Mississippi River basin.

As a part of the Upper Mississippi River Com-prehensive Basin Study, Appendix B identifies natural environmental systems by showing topognatural environmental systems by showing topography, vegetation, and water areas on maps. Designated on the maps are symbols indicating such natural features as wildlife, vegetation, land forms, water areas and water in motion; and such cultural resources as historic, archaeological, and modern structural developments. Symbols express special features of outstanding or better-thanaverage quality and are worthy of consideration in advance of developmental planning. This new advance of developmental planning. This new form of environmental resource inventory can be added as an overlay to the existing basic inventory maps of soil, topography, land use and cover, water resources, etc. The inventory mapping not only identified outstanding natural systems in the watershed, but clearly indicates where present and projected development may well destroy environmental quality. (See also W73-13480) (Woodard-USGS) USGS) W73-13482

UPPER MISSISSIPPI RIVER COMPREHENSIVE BASIN STUDY, APPENDIX C--CLIMATOLOGY AND METEOROLOGY. Army Engineer District, St. Louis, Mo.

Vol 3 available from UMRCBSCC, 2120 L St NW. voi 3 available from UMRCESSCC, 2120 L St NW, Washington, DC 20037 - Price \$4.50. In: Upper Mississippi River Comprehensive Basin Study Coordinating Committee (UMRCBSCC) Report, Washington, DC, Vol 3 of 9 volumes, p C1-C56, 1970. 40 fig, 13 tab, 34 ref.

Descriptors: *Water resources development, *Mississippi River basin, *Climatology, *Mississippi River I *Meteorology, Reviews, basin, *Climatology, s. Meteorological data, Rainfall, Snow, Sleet, Humidity, Dew point, Evaporation, Evapotranspiration, Fog. Water resources, Temperature, Winds, Storms, Hurricanes., Floods, Environmental damage, ricanes., Floods, Environmental of Forecasting. Identifiers: *Upper Mississippi River basin.

The various aspects of climate in the Upper Mississippi River basin and the activities of private, local public, state and Federal agencies working in this field are described. Previously published materials are used as sources of information. The climatological and meteorological picture is on a local, state, and regional basis, without regard to river basin boundaries. Consequently, the subject matter is not strictly confined to the basin, but is reasonably representative of it. A glossarv of reasonably representative of it. A glossary of generally unfamiliar terms is included. Normal angenerally unfamiliar terms is included. Normal an-nual precipitation ranges from about 20 inches in the northwest to about 46 inches in the south. Thunderstorms are the source of a large part of the total precipitation; they are also responsible for

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flash floods, lightning, and damaging winds. Lightning annually causes from 2 to 5 deaths per million population and from 53 to 58 million per basin state in losses to farm buildings. Hail, another byproduct of thunderstorms, causes an annual loss of \$22 million in livestock, automobiles, and crops in the principal five states of the basin. Generally, runoff into basin streams is adequate because precipitation amounts exceed those losses incurred through the soil by transpiration and evaporation. (See also W73-13480) (Woodard-USGS)

UPPER MISSISSIPPI COMPREHENSIVE BASIN STUDY, APPENDIX D-SURFACE WATER HYDROLOGY. Army Engineer District, St. Paul, Minn.

Vol 3 available from UMRCBSCC, 2120 L St NW, Washington, DC 20037 - Price \$4.50. In: Upper Mississippi River Comprehensive Basin Study Coordinating Committee (UMRCBSCC) Report, Washington, DC, Vol 3 of 9 volumes, p D1-D113, 1970. 50 fig, 8 tab, 26 ref.

Descriptors: "Water resources development, "Mississippi River basin, "Surface waters, "Hydrology, Reviews, Fojections, Hydrologidata, Data collections, Streamflow, Runoff, Flow rates, Floods, Peak discharge, Droughts, Base flow, Evaporation, Reservoirs, Water storage, Flood forecasting, Weather forecasting, Identifiers: "Upper Mississippi River basin.

This appendix (D), contains hydrologic data pertiment to analysis of water and related land resource problems and to the formulation of a comprehensive framework plan for the solution of such problems in the study area. Surface water hydrology, as used in this appendix, can be defined as the measurement, collection, and organization of surface water runoff data and interpretation of results. Runoff data are presented in a variety of ways. Maximum, average, and minimum runoff rates are tabulated for various time intervals. Flow duration, flood frequency, flow storage, and mass curves are included. Infiltration indexes and evaporation data are also included. In conjunction with runoff data several existing the potential reservoir sites have been investigated, and pertinent information relative to these sites is included. (See also W73-13480) (Woodard-USGS)

UPPER MISSISSIPPI COMPREHENSIVE BASIN STUDY, APPENDIX E-GROUND WATER AND GEOLOGY.

Vol 3 available from UMRCBSCC, 2120 L St NW, Washington, DC 20037 - Price \$4.50. In: Upper Mississippi River Comprehensive Basin Study Coordinating Committee (UMRCBSCC) Report, Washington, DC, Vol 3 of 9 volumes, p E1-E74, 1970. 22 fig, 12 tab, 119 ref.

Descriptors: *Water resources development,
*Mississippi River basin, *Groundwater resources, *Hydrogeology, *Aquifers, Hydrologic data, Geology, Aquifer characteristics, Water wells, Water yield, Water quality, Groundwater recharge, Water utilization, Water supply, Projections, Planning.

Identifiers: *Upper Mississippi River basin.

The groundwater resources of the study area are large and highly developed in a few urban-industrial centers. Those conducting comprehensive basin planning must therefore consider where this resource may be tapped, its adequacy for various categories of use, and how it can be managed to best advantage. This report was prepared in accord with the following specific set of objectives:

(1) to present a general description of the ground-

water hydrology of the basin, with emphasis on potential sources of large supplies adequate for municipal or industrial use; (2) to present the information in such a manner as to be readily usable in the formulation of long-range plans and as a guide for water management decisions by public water action agencies; and (3) to point out hydrologic factors that have become apparent in earlier studies that should be taken into consideration in formulating water resource management plans. (See also W/7-13480) (Woodard-USGS)

UPPER MISSISSIPPI RIVER COMPREHENSIVE BASIN STUDY, APPENDIX F-MINERAL RESOURCES.

Bureau of Mines, Twin Cities, Minn. Twin Cities
Office of Mineral Resources.

Vol 3 available from UMRCBSCC, 2120 L St NW, Washington, DC 20037 - Price \$4.50. In: Upper Mississippi River Comprehensive Basin Study Coordinating Committee (UMRCBSCC) Report, Washington, DC, Vol 3 of 9 volumes, p F1-F122, 1970. 26 fig., 75 tab, 125 ref.

Descriptors: *Water resources development, *Mississippi River basin, *Mineralogy, Metals, Coals, Petrography, Natural resources, Reviews, Gravels, Sands, Clays, Mining, Transportation, Navigation, Environmental effects, Planning, Projections, Management. Identifiers: *Upper Mississippi River basin.

Mineral resources are described as one part of the comprehensive study of water development and land utilization of the Upper Mississippi River basin. The study estimates mineral resource potential and evaluates soil and liquid mineral fuel production. These factors are related to water use, water availability, and water pollution. The causes and extent of such pollution are investigated and possible corrective measures are offered. In addition, land utilization is studied. All of these factors are evaluated for present conditions and for projections for the future. Mineral resources in the basin may be divided into two groups: export commodities, transported from their origins out of the region; and residentiary commodities, used locally or moved only small distances from their origins. Export mineral commodities are coal, iron ore, lead concentrates, zinc concentrates, industrial sands, dimension stone, natural gas, petroleum, natural abrasives, and some sand and gravel. Residentiary mineral commodities are sand and gravel, crushed stone, marl, clay, shale, and some dimension stone. (See also W73-13480) (Woodard-USGS)

UPPER MISSISSIPPI RIVER COMPREHENSIVE BASIN STUDY, APPENDIX G-FLUVIAL SEDI-

Army Engineer District, Rock Island, Ill.

Vol 3 available from UMRCBSCC, 2120 L St NW, Washington, DC 20037 - Price \$4.50. In: Upper Mississippi River Comprehensive Basin Study Coordinating Committee (UMRCBSCC) Report, Washington, DC, Vol 3 of 9 volumes, p G1-G100, 1970. 50 fig, 12 tab, 54 ref.

Descriptors: *Water resources development,
*Mississippi River basin, *Fluvial sediments,
Sedimentology, Sediment transport, Sedimentation, Sediments, Streamflow, Sediment yield,
Reservoir silting, Particle size, Sediment distribution, Land use, Sediment control, Erosion control,
Planning, Environmental control, Management.
Identifiers: *Upper Mississippi River basin.

A general appraisal is provided of sedimentation and related problems in the study area. This appraisal is made because of the importance of sediment in the overall management of water and re-

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lated land resources. This includes a definition of the sediment problems; the areal distribution, magnitudes, variability, characteristics of sediment; and trends in sediment yields. The appraisal is based on available data from State and Federal agencies actively engaged in the collection of such data during the last two to three decades. A primary objective is to evaluate the problems in water resources development which have been caused by the presence of sediment in streams and reservoirs, and which will have an important bearing on the future water resources development in the basin. A means is provided to estimate the probable rate of sediment deposition in reservoirs. Information useful in solving sediment problems involving water treatment, damage to land, channels, recreational facilities, reservoirs, and transportation facilities is also provided. The dollar damage from sediment is estimated. (See also W73-13480) (Woodard-USGS)

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UPPER MISSISSIPPI RIVER COMPREHENSIVE BASIN STUDY, APPENDIX H.-WATER SUPPLY AND QUALITY CONTROL. Federal Water Quality Administration, Chicago, Ill. Great Lakes Region.

Vol 4 available from UMRCBSCC, 2120 L St NW, Washington, DC 20037 - Price \$3.00. In: Upper Mississippi River Comprehensive Basin Study Coordinating Committee (UMRCBSCC) Report, Washington, DC, Vol 4 of 9 volumes, p H1-H342, 1970. 20 fig. 212 tab, 112 ref.

Descriptors: *Water resources development, *Mississippi River basin, *Water supply, *Water quality control, Reviews, Planning, Projections, Water demand, Industrial water, Municipal water, Groundwater resources, Surface waters, Water pollution sources, Municipal wastes, Industrial wates, Agricultural chemicals, Urbanization, Sediments, Water pollution control, Economics, Flow augmentation.

Guides are provided to future water resource development in the study area by indicating which subareas have water problems calling for future detailed planning efforts. In addition, the study outlines the characteristics of projected water and related land resource problems and the general approaches that appear appropriate for their solution, consistent with the best use of combination or uses of water and related land resources to meet all foreseeable short- and long-term needs. The study includes: collection of basic data on municipal and industrial water uses and all water-borne wastes; preliminary evaluation of the natural characteristics and capability of surface water to assimilate wastes; and the projections of municipal and industrial water needs and various types of wastes to the year 2020. Using the data collected and the preliminary evaluations as a basis, mathematical projections of total water requirements were made in order to furnish preliminary estimates of the storage needs for municipal and industrial water supply and for quality control water. (See also W73-13480) (Woodard-USGS)

UPPER MISSISSIPPI RIVER COMPREHENSIVE BASIN STUDY, APPENDIX I--FLOOD CON-TROL.

Army Engineer District, Chicago, Ill.

Vol 5 available from UMRCBSCC, 2120 L St NW, Washington, DC 20037 - Price \$3.00. In: Upper Mississippi River Comprehensive Basin Study Coordinating Committee (UMRCBSCC) Report, Washington, DC, Vol 5 of 9 volumes, p 11-1225, 1970. 53 fig, 131 tab, 73 ref.

Descriptors: *Water resources development, *Mississippi River basin, *Flood control, Projection, Flood damage, Agriculture, Flood forecasting, Flood data, Flood flow, Flood frequency, Flood peak, Flood plain zoning, Flood profiles, Flood protection, Planning, Identifiers: *Upper Mississippi River basin.

The Upper Mississippi River Comprehensive Basin Study will develop a framework plan for the best use or combination of uses of water and related land resources to meet foreseeable shorterm and long-term needs of the basin. This appendix (I) presents an assessment of flood problems in the basin; their causes, effects, and possible alternatives for their solution. A framework plan or strategy for reduction of flood damages is developed. Opportunities for flood damages reduction are based on the results of re-analysis of previous Corps of Engineers and Soil Conservation Service studies, and the evaluation of alternative means of development based on a national efficiency objective, which results in an economic evaluation and benefit/cost ratio equal to or better than unity. Opportunities for development and conservation of the water resources are analyzed in relation to the flood problems in the basin. (See also W73-13480) (Woodard-USGS)

UPPER MISSISSIPPI RIVER COMPREHENSIVE BASIN STUDY, APPENDIX J-NAVIGATION. Corps of Engineers, Chicago, Ill. North Central Div.

Vol 5 available from UMRCBSCC, 2120 L St NW, Washington, DC 20037 - Price \$3.00. In: Upper Mississippi River Comprehensive Basin Study Coordinating Committee (UMRCBSCC) Report, Washington, DC, Vol 5 of 9 volumes, p J1-J115, 1970. 29 fig, 32 tab, 29 ref.

Descriptors: "Water resources development, "Mississippi River basin, "Navigation, "Inland waterways, Planning, Management, Legal aspects, Economics, Transportation, Boats, Barges, Recreation, Boating, Ecology, Fish, Wildlife, Environmental control. Identifiers: "Upper Mississippi River basin, Commercial transportation, Commodities.

Information about the transportation and recreational boating use of the Upper Mississippi River Basin's inland waterways is presented. Estimates of Federal, State and local program requirements are given for the planning periods 1966, 1980, 2000, and 2020. These estimates are of a reconnaissance nature and provide a base for future improved technical planning for the development and management of the basin's navigation system. The national and reqional transportation are important in the projections of waterborne commerce for the basin. Factors relating to the total volume of all commodities transported, geographic distributions of the five principal modes of transportation in the basin and the region, and individual advantages of each transportation system are basic to the development of national, multistate, and regional projection of commodity movements. (See also W73-13480) (Woodard-USGS)

UPPER MISSISSIPPI RIVER COMPREHENSIVE BASIN STUDY, APPENDIX K-RECREATION. Bureau of Outdoor Recreation, Ann Arbor, Mich. Lake Central Region Office.

Vol 6 available from UMRCBSCC, 2120 L St NW, Washington, DC 20037 - Price \$4.50. In: Upper Mississipp River Comprehensive Basin Study Coordinating Committee (UMRCBSCC) Report, Washington, DC, Vol 6 of 9 volumes, p K1-K126, 1970. 75 fig, 41 tab, 95 ref. Descriptors: Water resources development, *Mississippi River basin, *Recreation, *Water sports, Reviews, Planning, Projections, Economics, Human population, *Tourism, *Land use, Topography, *Recreation facilities, Employment, Social aspects, National parks, Management.

Appendix K is a joint cooperative effort of the various state and Federal agencies who served as members of the Recreation Advisory Committee. The consideration of outdoor recreation opportunities is an important aspect of the overall study. Specificially, the outdoor recreation portion of the study seeks to: (1) inventory existing and potential recreation resources in the basin; (2) determine use pressures on existing facilities and the immediate demand for additional developments; (3) establish long-range needs and goals for providing adequate recreational opportunities to the year 2020; and (4) recommend a plan of action or programs for increasing present and future resource capabilities for satisfying recreation requirements. Recreation is a major industry in the basin. It dominates the economies of the tourist destination counties in northern Wisconsin and Minnesota. Recreation adds nearly it billion dollars annually to the state's economy. In addition, outdoor recreation provides nearly one-fifth of the total state employment and accounts for over 80 percent of the summer weekend highway peak loads. (See also W73-13480) (Woodard-USGS)

UPPER MISSISSIPPI RIVER COMPREHENSIVE BASIN STUDY, APPENDIX L-FISH AND WIL-DLIFE RESOURCES.

Bureau of Sport Fisheries and Wildlife, Minneapolis, Minn.

Vol 6 available from UMRCBSCC, 2120 L St NW, Washington, DC 20037 - Price \$4.50. In: Upper Mississippi River Comprehensive Basin Study Coordinating Committee (UMRCBSCC), Report, Washington, DC, Vol 6 of 9 volumes, p L1-L103, 1970. 23 fig, 23 tab, 33 ref.

Descriptors: Water resources development, *Mississippi River basin, *Pish, *Wildlife, Reviews, Water quality control, *Sport fish, Commercial fishing, Economics, Fisheries, Climates, Vegetation, Soils, Water resources, Human population, Transportation, Agriculture, Industries, Water pollution control, Water quality, *Planning, *Projections.

Appendix L is the joint effort of numerous State and Federal agencies working through a Fish and Wildlife Advisory Committee. Plans for meeting needs for sport fish and wildlife opportunities fall under several broad categories. They are geared in scope and number to the problems of the particular basin subarea. In general, planners, political authorities, and management experts attempt to accomplish the following: (1) increase the utilization of existing resources through improved access, increased acquisition of public-use fish and wildlife facilities near metropolitan areas, greater emphasis on under-utilized species, and creative enhancement techniques on available habitat; (2) firm and immediate correction of degrading pollution problems; (3) better communication between Federal and State conservation agencies and between agencies with varying or conflicting interests in basin natural resources; (4) continued acceleration of research studies on pesticides, thermal effects, and other expanding pollution problems; and (5) preservation of unique environmental systems which will otherwise be lost to future generations. (See also W73-13480) (Woodard-USGS)

UPPER MISSISSIPPI RIVER COMPREHENSIVE BASIN STUDY, APPENDIX M-POWER. Federal Power Commission, Chicago, Ill. Vol 6 available from UMRCBSCC, 2120 L St NW, Washington, DC 20037 - Price \$4.50. In: Upper Mississippi River Comprehensive Basin Study Coordinating Committee (UMRCBSCC), Report, Washington, DC, Vol 6 of 9 volumes, p M1-M68, 1970. 23 fig, 29 tab.

Descriptors: Water resources development, *Mississippi River basin, *Hydroelectric power, Reviews, *Planning, Projections, Electric power demand, Economics, Costs, Human population, *Industries, *Powerplants, Cooling water.

Future electric power requirements and supply in the study area are discussed. The projections of future electric power needs are made, not only to determine the probable effect on the basin economy and use of its natural resources, such as fuel, but to develop estimates of future needs for cooling water. The Upper Mississippi River basin (UMRB) is that portion of the north-central United States encompassing the Mississippi River and all streams draining into it above the Ohio River excluding the Missouri River. The area covers the larger parts of Minnesota, Wisconsin, Illinois, and Iowa; and reaches into Indiana, South Dakota, and Missouri. In 1960 the UMRB Power Region, with an area of 178,000 square miles, had a population of 18,805,477 accounting for 5% of the area of the nation and 10.5% of the population. The average population density of 106 per square mile is stightly more than double the national average. Population density varies considerably within the basin. The total energy requirement for the region in 1960 was less than 100 billion kWh. The projected energy requirement for the year 2020 is more than 1600 billion kWh. (See also W73-13480) (Woodard-USGS)

UPPER MISSISSIPPI RIVER COMPREHENSIVE BASIN STUDY, APPENDIX N-AGRICULTURE. Soil Conservation Service, Washington, D.C.

Vol 6 available from UMRCBSCC, 2120 L St NW, Washington, DC 20037 - Price \$4.50. In: Upper Mississippi River Comprehensive Basin Study Coordinating Committee (UMRCBSCC), Report, Washington, DC, Vol 6 of 9 volumes, p NI-N210, 1970. 64 fig, 112 tab, 25 ref.

Descriptors: Water resources development, *Mississippi River basin, *Agriculture, *Crop production, *Planning, Projections, Reviews, Natural resources, Climates, Topography, Geology, Land use, Water resources, Economics, Flood protection, *Irrigation, Groundwater, Surface waters, Water supply, Water quality, Water pollution control.

Appendix N was prepared by the Soil Conservation Service, Forest Service, and Economic
Research Service, in the Department of Agriculture. The study of agricultural land and water use
and development was based upon an economic
analysis which includes consideration for the
basin's share of the nation's demand for food,
feed, and fiber. This share included projected
domestic demands plus export requirements. The
methodology recognizes a physical and economic
interrelationship between watersheds and subareas and between projects in the plan formulation. This relationship introduces a broader scope
to the study than would be obtained if individual
areas and projects were considered separately.
Three systems were used for delineating subparts
of the basin to develop data. These were: (1)
hydrologic subareas, (2) basin plan areas, and (3)
economic subregions. The planning area of 302
counties in seven states is somewhat larger than
the 189,037 square-mile drainage area of the basin.
(See also W73-13480) (Woodard-USGS)
W73-13494

UPPER MISSISSIPPI RIVER COMPREHENSIVE BASIN STUDY, APPENDIX O-STATE AND

Field 06-WATER RESOURCES PLANNING

Group 6B-Evaluation Process

FEDERAL WATER LAWS, POLICIES, AND PROGRAMS. Corps of Engineers, Chicago, Ill. North Central

Vol 7 available from UMRCBSCC, 2120 L St NW. vot / available from UMRCBSCC, 2120 L St NW, Washington, DC 20037 - Price \$4.50. In: Upper Mississippi River Comprehensive Basin Study Coordinating Committee (UMRCBSCC), Report, Washington, DC, Vol 7 of 9 volumes, 1970. 559 p, 1 fig. 4 tab, 83 ref.

Descriptors: Water resources development, "Mississippi River basin, "Water law, "Water policy, Programs, "Federal Government, "State governments, Water supply, Water demand, Economics, Agriculture, Industries, Urbanization, Public health, Water utilization, Water quality, Water pollution control, Surface waters, Groundwater, Land use, Management, Legal aspects, Water rights, Eavironmental control.

rights, Environmental control.

Appendix O was prepared jointly by the U.S. Army Engineer District, Chicago, and the states of Illinois, Indiana, Iowa, Minnesota, Missouri, South Dakota and Wisconsin. Executive policies, standards, and procedures have been established for uniform application in the formulation, evaluation, and review of comprehensive river basin plans and individual project plans for use and development of water and related land resources. The basic objective in the formulation of plans is to provide the best use, or combination of uses, of water and related land resources to meet all foreseeable short- and long-range needs. In pursuit of this basic conservation objective, full consideration is given to the development, preservation, and well-being of the people. Water laws of the states which are included in the Upper Missispip River basin are based on the riparian doctrine. This provides that owners of the land along a stream share equally in the use of the water, as long as each riparian owner is reasonable in his use. However, each land owner's right to make reasonable use of the water is limited by the equal right of all other land owners along the same watersourse. (See also W73-11480) (Woodard. right of all other land owners along the same watercourse. (See also W73-13480) (Woodard-USGS)

UPPER MISSISSIPPI RIVER COMPREHENSIVE BASIN STUDY, APPENDIX P-ECONOMIC BASE STUDY AND PROJECTIONS. Vol 8 available from UMRCBSCC, 2120 L St NW,

vot 8 available from UMRCBSCC, 2120 L St NW, Washington, DC 20037 - Price \$2.00. Upper Mis-sissippi River Comprehensive Basin Study Coor-dinating Committee (UMRCBSCC) Report, Washington, DC, Vol 8 of 9 volumes, 1970. 194 p, 61 fig, 107 tab.

Descriptors: "Water resources development,
"Mississippi River basin, "Economics, "Projections, Regional economics, Social aspects, Human population, Labor supply, Wages, Industries, Employment, Agriculture, Land use, Livestock, Forestry, Mineralogy, Electric power industry, Recreation, Navigation, Flood control. Identifiers: "Upper Mississippi River basin.

The economic base study and projections are presented for developing necessary information regarding the future economic and demographic changes of the study area to serve as guides for the development of water resource requirements or demands. These demands are projected based on the information supplied in this appendix and, together with related materials, will be used as the basis for determining the water and related land resource needs and the required development. Summary statements are included of methodologies proposed for use by Federal agencies and states in developing the demands that have been placed upon water resources based on the projections. On the basis of the data and projections developed, quantitative, qualitative and time-phased requirements for present and future con-

trol, use, and conservation of water in related land resources of the basin will be determined by the Federal agencies and states cooperating in this study. The plan to be developed will be for flood control, navigation, hydroelectric power, municipal and industrial water supply, water quality control, recreation, fish and wildlife conservation, agriculture, forestry, and other water related land uses. (See also W73-13480) (Woodard-USGS)

UPPER MISSISSIPPI RIVER COMPREHENSIVE BASIN STUDY, APPENDIX Q-FRAMEWORK FOR DEVELOPMENT.

vot y available from UMRCBSCC, 2120 L St NW, Washington, DC 20037 - Price \$3.00. Upper Mis-sissippi River Comprehensive Basin Study Coor-dinating Committee (UMRCBSCC), Report, Washington, DC, Vol 9 of 9 volumes, 1972. 306 p, 75 fig, 132 tab.

Descriptors: Water resources development, "Missispip River basin, "Management, Surface waters, Groundwater, Water supply, "Water demand, Natural resources, Water quality, Water pollution control, Land use, Flood control, 'Land management, Economics, Legal aspects, Social aspects, Human population, Forestry, Industrial water, Municipal water, Agriculture, Recreation, Fish, Wildlife, Urbanization, Sediments, Erosion control, Urbanization, "Planning, Projections, Programs, Environmental control. Identifiers: "Regional development guidelines.

A comprehensive framework is presented to solve problems and meet future needs for water and related land resource development in the study area. Coulcilense published by the Water Resources Council were followed. These guidelines provided for a preliminary or reconnaissance-type investigation intended to provide broad-scale analyses of water and related land resource problems, and to furnish general appraisals of the probable nature, extent, and timing of measures for their resolution. The Plan Formulation Task Group combined the information included in the sixteen resource appendixes and the individual suggestions in the appendixes into a broad framework for meeting the identified needs. The group also took into account the interacting nature of many requirements in the planning process. The studies in the appendixes define the availability of water and related land resources within the basin. The economic studies describe the present and past population and employment trends of the basin as well as the projected level of the economy and related growth factors. Legal studies summarize the basin information on laws and regulations involving ownership, control, and use of the water resources within the basin. The special purpose studies present an inventory of existing development, determined projected demands for goods and services, and described single-purpose plans to meet identified net needs. The framework is directed towards satisfying the needs of people, and is flexible enough to accommodate variation in need and political choices. (See also W73-13480) (Woodard-USGS)

ECONOMIC CRITERIA FOR DECISIONS ON PRESERVATION AND USE OF INLAND WET-LANDS IN MASSACHUSETTS, Massachusetts Univ., Amberst. Dept. of Agricultural and Food Economics:

tural and Food Economics: T. R. Gupta. Journal of Northeastern Agricultural Economics Council, Vol 1, No 1, p 201-210, Summer 1972. 1 tab, 5 ref. OWRR B-023-MASS (4).

Descriptors: "Wetlands, "Conservation, "Land development, "Massachusetts, Reviews, Evalua-tion, Economics, Social aspects, Environmental effects, Ecology, Recreation, Wildlife conserva-tion, Planning.

The criteria for decisions on preservation or development of inland wetlands in Massachusetts are evaluated. Wetlands may be considered productive habitats for wildlife with both commerare evaluated. Wetlands may be considered productive habitats for wildlife with both commercial and aesthetic values, of visual cultural values, as buffers against floods, of materials possessing biological and educational values, and of water supply. The quantity and quality of these benefits will depend upon many factors, most important of which are the nature and location of a wetland itself. Contrarily, wetlands in their altered forms are capable of helping production of other economic goods and services such as food, other recreation, housing, commercial and industrial sites, and transportation facilities for which the human race continues to strive under the banner of economic development. In the context of these conflicting aspects of productivity, the necessity of choice among the social values of preserved versus altered use of wetlands exists. The approach here is to examine all potential benefits and costs of preserving wetlands in order to come up with criteria for optimum decisions. (Woodard-USGS) W73-13518

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PROBLEMS,
Greeley and Hansen, Chicago, Ill.
For primary bibliographic entry see Field 05G.

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

RESERVOIR MANAGEMENT: OPTIMAL PRIC-RESERVOIR MANAGEMENT: OFTIMAL FIGURE ON AND RATIONING POLICIES UNDER UNCERTAINTY, Montpellier Univ. (France). Faculte des Sciences. For primary bibliographic entry see Field 04A.

For primar W73-13141

TREATMENT OF SOME OF THE UNCERTAINTIES ENCOUNTERED IN THE CONDUCT OF HYDROLOGIC COST-EFFECTIVENESS EVALUATIONS. EVALUATIONS, North American Rockwell Corp., Downey, Calif. Space Div. For primary bibliographic entry see Field 06B. W73-13154

ESTIMATING COOLING TOWER COSTS FROM OPERATING DATA, For primary bibliographic entry see Field 05D. W73-13432

6D. Water Demand

EVALUATION OF DISCONTINUITIES IN RE-GIONAL POPULATION PROJECTIONS, Massachusetts Univ., Amherst. Dept. of Sociolo-

gy. For primary bibliographic entry see Field 06B. W73-13006

A COMPARISON OF CONSUMER'S SURPLUS AND MONOPOLY REVENUE ESTIMATES OF RECREATIONAL VALUE FOR TWO UTAR WATERFOWL MARSHES, Utah Center for Water Resources Research,

ary bibliographic entry see Field 06B.

PRELIMINARY STUDY OF POTENTIAL SITES FOR WATER-SUPPLY RESERVOIRS IN WEST AND SOUTHEAST ALABAMA, Geological Survey of Alabama, University. L. B. Peirce, J. R. Clark, and W. E. Smith.

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Available from NT18, Springfield, Va 22151 PB-216 997 Price \$3.00 printed copy; \$1.45 microfiche. Alabama Development Office, Montgomery Spe-cial Studies Division Planning Report, September 1972. 119 p, 2 fig, 1 tab, 11 ref.

Descriptors: "Reservoir sites, Water resources development, "Water demand, "Potential water supply, "Reservoir storage, "Alabama, Watershed management, Water utilization, Planning, Design criteria, Projections, River basin development, Municipal water, Industrial water, Recreation, Irmunicipal water, Industrial water, Recreation, Irrigation, Navigation, Water quality control, Flood control

Projections to the year 2020 indicate that the de-mand for water in Alabama could be 7 billion gal-lons per day greater than in 1970. Much of this ad-ditional water can be made available through more ditional water can be made available through more intensive use of groundwater supplies and the further development of the major rivers, but a substantial part must come from storage reservoirs constructed on many of the presently undeveloped minor streams. Forty-four potential reservoir sites are identified on minor streams in Alabama, exclusive of the Alabama and the Tennessee River basins. Each site is described with regard to location and various topographic, hydrologic, and geologic characteristics pertinent to preliminary reservoir planning and design. Construction of reservoirs at the sites catalogued would provide an aggregate storage capacity of 3,750,000 acre-feet and would add about 200,000 acres to the State's water surface. The reservoirs would provide a and would add about 200,000 acres to the State's water surface. The reservoirs would provide a sustained yield of about 3.5 billion gallons per day that could be used for municipal, industrial, or that could be used for municipal, industrial, or agricultural water supply or to augment stream-flow for navigation or water-quality control. In addition, the reservoirs would offer valuable benefits for recreation, fish and wildlife conservation, and in some cases flood control. (Woodard-USGS) W73-13041

PUBLIC AND INDUSTRIAL WATER SUPPLIES IN NORTHERN MISSISSIPPI, Geological Survey, Jackson, Miss. J. A. Callahan.

Mississippi Board of Water Commissioners Bul-letin 73-1, 1973. 68 p, 7 fig, 20 ref.

Descriptors: *Water supply, *Surface waters, *Groundwater, *Mississippi, *Industrial water, *Municipal water, Water utilization, Consumptive use, Water wells, Rivers, Well data, Water levels, Water quality, Hydrologic data, Basic data collec-

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Public and industrial water withdrawals for the 45 counties of northern Mississippi were more than 200 mgd in 1971. Usage was divided about equally between public supplies and self-supplied industry. Of the total usage, 6 mgd was from streams. The city of Columbus, pumping from Luxapalila Creek, is the only public supply using surface water; all other public supplies are obtained from wells. Two million gallons per day of self-supplied industrial water is obtained from one stream, the Sunflower River. Producing aquifers range is Sunniver River. Producing aquifers range in age from Paleozoic to Holocene. The most widely used aquifers are the Meridian-upper Wilcox and the Sparta Sand of Eocene age, but the largest withdrawals, over 50 mgd, are made from the Mississippi River alluvium. (Woodard-USGS) W73-13042

RESERVOIR MANAGEMENT: OPTIMAL PRICING AND RATIONING POLICIES UNDER UN-

CERTAINTY,
Montpellier Univ. (France). Faculte des Sciences.
For primary bibliographic entry see Field 04A.
W73-13141

THE IMPACT OF WATER RESOURCES ON THE LOCATION OF ECONOMIC ACTIVITIES, Technische Hochschule, Munich (West Germany).

M. J. Beckmann. In: Proceedings (Vol. II), International Symposi-um on Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tuc-son, December 11-14, 1972. p 691-695, (1972). 1 fig, 2 ref.

Descriptors: *Water resources, *Economics, Water'users, Labor, Energy, Marketing. Identifiers: *Location theory, *Economic activi-

Water is discussed as an input into production and as a consumption good. It is also discussed in rela-tion to the economic theory of the location of ac-tivities, where certain basic principles are set forth that guide the efficient location of economic acthat guide the efficient location of economic ac-tivities which underly the corrective forces of competitive markets. There can be no doubt that water plays an important role in determining loca-tional choices. It tends, however, to be overshowed by other influences. Thus, water is inovershowed by other influences. I has, water is in-dispensable as a cooling agent in energy produc-tion from fuel resources. But thermal energy production is definitely oriented towards fuel loca-tions including locations to which fuel can be brought cheaply by sea or waterway. (See also W73-13134) (Bell-Cornell)

GEOTHERMAL ENERGY-RESOURCES, PRODUCTION, STIMULATION. Stanford Univ., Calif. Dept. of Civil Engineering.

Available from Stanford University Press, Stanford, Calif Price \$17.50. Proceedings of Special Symposium of American Nuclear Society, June 19-20, 1972: Stanford University Press, P. Kruger, and C. Otte, editors, Stanford, Calif, 1973. 360 p.

Descriptors: "Geothermal studies, "Electric power, "Electric power demand, "Thermal power-plants, Electric power production, Hydrogeology, Water resources development, Energy, Steam tur-

bines, Wells.
Identifiers: *Geothermal power, *Power demand.

An assessment is given of the potential of geother-An assessment is given our the potentian or geother-mal energy in meeting the increasing energy de-mand within the United States during the next few decades and in conserving our fossil fuels. World-wide status, principles of occurrence, resource potential, and exploration techniques of geother-mal energy are reviewed. The discussion includes production, forms of utilization, environmental impact, and well stimulation by nuclear, chemical, and mechanical techniques. Geothermal energy and mechanical techniques. Geothermal energy will be used largely for the generation of electric power. The nation's geothermal energy resource is potentially vast, particularly the portion that may be tapped by deeper drilling. Most of the resources are of the liquid-dominated type, rather than the vapor-dominated type exemplified by the field at The Geysers, in California. Development of the technology for the vapor-turbine cycle will permit the development of liquid-dominated resources of intermediate-range temperatures (in excess of 300 deg F), and thus vastly increase available geothermal resources. Electric power produced from a geothermal field appears to be economically competitive with that from fossil-fuel stations. The environmental impact of geothermal power developpetitive with that from fossil-fuel stations. The environmental impact of geothermal power development is more acceptable than that of fossil- or nuclear-fuel power development. The United States could be producing at least 132,000 Mw of electric power from its geothermal resources in 1985. (See W73-13215 thru W73-13232) (Knapp-USGS) W73-13214

INTRODUCTION: THE ENERGY OUTLOOK, Union Oil Co. of California. Los Angeles.

Onton Or Co. Cantonias. Los Angeles.

C. Otte, and P. Kruger.

In: Geothermal Energy—Resources, Production, Stimulation; Proceedings of Special Symposium of American Nuclear Society, June 19-20, 1972: Stan-

ford University Press, Stanford, Calif, p 1-13, 1973. 2 fig, 4 tab, 10 ref.

Descriptors: "Geothermal studies, "Electric power, "Electric power demand, "Thermal power-plants, Electric power production, Hydrogeology, Water resources development, Energy, Steam tur-bines, Wells. Identifiers: "Geothermal power, "Power demand.

During the period 1971-85 energy consumption in the United States is forecast to grow at an average rate of 4.2% per year. Domestic supplies will grow at an average rate of 2.6% per year. By 1985 domestic supplies will satisfy only about 70% of U.S. consumption. In order to meet growing demands for pertroleum liquids, imports would have to increase more than fourfold by 1985. Potential gas demand would approximately double between 1970 and 1985. Dependence on imports would rise from 4% of gas supplies in 1970 to more than 28% in 1985. The supply of domestic coal, including exin 1985. The supply of domestic coal, including exports, will increase from 590 million tons in 1970 to some 1,071 million tons in 1985. Coal reserves are some 1,071 million tons in 1965. Contreserves all ample and could support a faster growth rate in production. By 1985 nuclear energy will be supplying 48% of total electric power requirements. The production. By 1985 nuclear energy will be supplying 48% of total electric power requirements. The remaining fuels—hydroelectric power, geothermal power, and crude oil from shale—will together contribute only 3% of energy requirements in 1985. Among the undeveloped sources of energy, a likely candidate for early development in large quantities is geothermal energy. An assessment is given of the potential of geothermal energy in meeting the increasing energy demand within the United States during the next few decades and in conserving our fossil fuels. (See also W73-13214) (Knapp-USGS) W73-13215

WORLDWIDE STATUS OF GEOTHERMAL RESOURCES DEVELOPMENT, California Div. of Mines and Geology, Sacramen-

J. B. Koenig. In: Geothermal Energy-Resources, Production, Stimulation; Proceedings of Special Symposium of American Nuclear Society, June 19-20, 1972: Stanford University Press, Stanford, Calif, p 15-58, 1973. 4 fig, 4 tab.

Descriptors: "Geothermal studies, "Electric power, "Electric power demand, "Thermal power-plants, Electric power production, Hydrogeology, Water resources development, Energy, Stream Identifiers: *Geothermal power, *Power demand.

A conservative projection of worldwide geothermal generating capacity by 1980 is on the order of 2,500 Mw, or three times present day capacity. Because world consumption of electricity during the 8-year period is likely to double, the geothermal power component of world output will remain at less than 1% of total generating capacity. Highenthalpy geothermal systems are known only in regions of youthful volcanism, crustal rifting, and recent mountain building. The major geothermal and volcanic belts are the circum-Pacific margin, island groups of the mid-Atlantic rift, the rift zones of east Africa and the adjacent Middle East, and the irregular belt of mountains and basins extending from the Mediterranean basin of Europe and north Africa across Asia to the Pacific. Lower-enthalpy fluids are far more abundant in volcanic zones and elsewhere, and may represent a greater reserve of useful energy by an order of magnitude or more. Significant areas of lower-enthalpy geothermal fluids include the Gulf Coast of the United States, an extensive region in western Siberia, and portions of central Europe just north of the Alps and the Carpathian Mountains. Geologically, these are subsiding sedimentary basins at the margins of folded mountain ranges. The distribution of geothermal resources on a worldwide scale is summarized, development A conservative projection of worldwide geother

Field 06-WATER RESOURCES PLANNING

Group 6D-Water Demand

and exploration activities are reviewed, and the potential for development over the next decade is evaluated. (See also W73-13214) (Knapp-USGS) W73-13216

ASSESSMENT OF U.S. GEOTHERMAL

RESOURCES, California Univ., Riverside. Inst. of Geophysics and Planetary Physics. R. W. Rex, and D. J. Howell.

B. W., Kex, and D. J. Howell. In: Geothermal Energy-Resources, Production, Stimulation; Proceedings of Special Symposium of American Nuclear Society, June 19-20, 1972: Stan-ford University Press, Stanford, Calif, p 59-67, 1973. 4 tab, 1 ref.

Descriptors: "Geothermal studies, "Electric power, "Electric power demand, "Thermal power-plants, Electric power production, Hydrogeology, Water resources development, Energy, Steam tur-

bines, Wells. Identifiers: *Geothermal power, *Power demand.

Geothermal energy is not only technically feasible but also practical and economical. Present plants utilize natural underground steam. Hot-water geothermal fields are now under test in the Imperial Valley of California and will be on line in a similar geological setting in northwestern Mexico in 1973. Thus, in the United States geothermal energy can be considered a competitively proved energy source. The western third of the United States, including Alaska and Hawaii, is the most richly endowed in accessible geothermal energy resources. Volcanic energy alone constitutes a reserve of energy which is probably adequate to moet U.S. electrical energy needs for several contents. Geothermal energy should be capable of supplying a major portion of future U.S. electrical energy requirements. Its development would inenergy requirements. Its development would in-volve costs lower than those for competing energy systems. Several computer models were utilized to determine how sensitive the profitability and, therefore, the economic feasibility of developing therefore, the economic feasibility of developing the geothermal resource would be to variations in each cost element. Approximately 1,200 test cases were run for this analysis. The analysis covered the three types of geothermal reservoirs: vapor dominated, hot water, and hot, dry rock systems. (See also W73-13214) (Knapp-USGS) W73-13217

CHARACTERISTICS GEOTHERMAL. OF

Geological Survey, Menlo Park, Calif. For primary bibliographic entry see Field 03E. W73-13218

EXPLORATIONS FOR GEOTHERMAL

RESOURCES,
California Univ., Riverside. Dept. of Geological Sciences; and California Univ., Riverside. Inst. of Geophysics and Planetary Physics.
For primary bibliographic entry see Field 03E.

W73-13219

STEAM PRODUCTION AT THE GEYSERS GEOTHERMAL FIELD, Union Oil Co. of California, Cloverdale. Big Geysers Station.
For primary bibliographic entry see Field 03E.
W73-13220

DESIGN AND OPERATION OF THE GEYSERS

POWER PLANT, Pacific Gas and Electric Co., San Francisco, Calif. For primary bibliographic entry see Field 08C. W73-13221

THE VAPOR-TURBINE CYCLE GEOTHERMAL POWER GENERATION, For primary bibliographic entry see Field 08C. FOR W73-13222

WATER FROM GEOTHERMAL RESOURCES, California Univ., Berkeley. Sea Water Conversion For primary bibliographic entry see Field 03A.

ENVIRONMENTAL IMPACT OF GEOTHER-MAL DEVELOPMENT,
Oregon State Dept. of Geology and Mineral Industries, Portland.

For primary bibliographic entry see Field 06G. W73-13224

STIMULATION OF GEOTHERMAL SYSTEMS, Division of Applied Technology (AEC), Washitton, D.C. For primary bibliographic entry see Field 08C. W73-13225

RECOVERY OF GEOTHERMAL ENERGY FROM HOT, DRY ROCK WITH NUCLEAR EX-PLOSIVES, Battelle-Northwest, Richland, Wash. Geothermal

Programs. For primary bibliographic entry see Field 08H. W73-13226

EXPLOSIVE STIMULATION OF HYDROTHER-MAL RESERVOIRS, Stanford Univ., Calif. Dept. of Petroleum En-

For primary bibliographic entry see Field 08H. W73-13227

INDUCTION AND GROWTH OF FRACTURES IN HOT ROCK, Los Alamos Scientific Lab., N. Mex.

For primary bibliographic entry see Field 08H. W73-13228

CHEMICAL EXPLOSIVE STIMULATION OF GEOTHERMAL WELLS, Naval Weapons Center, China Lake, Calif. Research Dept. For primary bibliographic entry see Field 08H. W73-13229 CHEMICAL EXPLOSIVE STIMULATION OF

ENVIRONMENTAL ASPECTS OF NUCLEAR

STIMULATION, Utah Univ., Salt Lake City. Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 08H.
W73-13230

CORROSION AND SCALING IN NUCLEAR-STIMULATED GEOTHERMAL POWER POWER

California Univ., Livermore. Lawrence Liverore Lab. For primary bibliographic entry see Field 08H. W73-13231

GEOTHERMAL RESOURCES RESEARCH.

GEOTHERMAL RESOURCES RESEARCH, National Science Foundation, Washington, D.C. Div. of Advanced Technology Applications. J. C. Denton, and D. D. Dunlop. In: Geothermal Energy-Resources, Production, Stimulation; Proceedings of Special Symposium of American Nuclear Society, June 19-20, 1972: Stan-ford University Press, Stanford, Calif., p 335-346,

Descriptors: *Geothermal studies, *Electric power, *Electric power demand, *Thermal power-plants, Electric power production, Hydrogeology, Water resources development, Energy, Steam tur-

Identifiers: *Geothermal power, *Power demand.

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Identifiers: *Geothermal power, *Power demand. The objectives of geothermal resource exploration are to locate areas underlain by hot rock; to estimate their volume, temperature, and permeability; and to determine the nature of any producible fluids. Theoretically, this energy source can be tapped from any point on earth simply by drilling sufficiently deep holes, providing passage for some heat-transfer fluid, and extracting the heat. Practically speaking, this hot mass is much too deep to tap in many large areas of the world. Occasionally the source is so close as to be manifested by such surface phenomena as geysers and hot springs. Reservoir engineering involves assessment of the size and deliverability of the geothermal resource and planning for optimum development. Well-stimulation technology is concerned with improving the permeability of the formation, which is important in both production and reinjection. Hydrofracturing, acid treatments, thermal fracturing, and chemical- and nuclear-explosion fracturing should all be considered. Potential environmental effects that need to be examined are agaseous and particulate emissions, land modification, subsidence, seismic hazards, surface-water and groundwater pollution, biological effects, noise effects, and social effects. A research program should emphasize the development of (1) vapor-turbine power-generating systems, (2) improved exploration methods, (3) desalination methods for geothermal fluids, (4) cheaper methods for deep drilling into hot formations, and (5) better models of geothermal reservoirs. (See also W73-13214) (Knapp-USGS)

UPPER MISSISSIPPI RIVER COMPREHENSIVE BASIN STUDY, APPENDIX K-RECREATION.
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UPPER MISSISSIPPI RIVER COMPREHENSIVE BASIN STUDY, APPENDIX P-ECONOMIC BASE STUDY AND PROJECTIONS. For primary bibliographic entry see Field 06B. W73-13496

UPPER MISSISSIPPI RIVER COMPREHENSIVE BASIN STUDY, APPENDIX Q-FRAMEWORK FOR DEVELOPMENT. For primary bibliographic entry see Field 06B. W73-13497

6E. Water Law and Institutions

ATTITUDES OF RIPARIANS TOWARDS THEIR LAKE ENVIRONMENTS: A STUDY OF LAKE WYOLA AND DAMON POND, MAS-WYOLA AND DAMON POND, MAS-SACHUSETTS, Massachusetts Univ., Amherst. Dept. of Land-scape Architecture. For primary bibliographic entry see Field 06A. W73-13007

ATTITUDES, VALUES, AND PERCEPTIONS IN WATER RESOURCE DECISION-MAKING WITHIN A METROPOLITAN AREA, Massachusetts Univ., Boston. Dept. of Political

For primary bibliographic entry see Field 06B. W73-13008

ENVIRONMENTAL PROTECTION THROUGH PUBLIC AND PRIVATE DEVELOPMENT CON-TROLS,

Pennsylvania Univ., Philadelphia. Inst. for Environmental Studies vironmental Studies.
For primary bibliographic entry see Field 05G.
W73-13025

A DECADE OF JUDICIAL DEVELOPMENTS AND CHANGES IN COLORADO WATER LAW: 1960-1970, Colorado State Univ., Fort Collins. Dept. of

Economics.
P. M. Ashton, and G. E. Radosevich.
Report NRE-13, June 1972. 26 p, 15 ref. OWRR-

Descriptors: *Colorado, *Water law, *Judicial decisions, *Legal aspects, Water rights, Administrative decisions, Law enforcement, Water resources development, Water policy, Legal review, Diversion, Diversion structures, Reasonable use, Water management (Applied), Water rights, State jurisdiction, State governments, Regulation.

Some of the major decisions pertaining to Colorado water law are reviewed with emphasis on those significant cases illustrating divergence from earlier precendents. Treatment of statutory law where relevant is included. The prime objective is not to provide a general synopsis of current Colorado water law, but rather to bring the reader Colorado water law, but rather to bring the reader up to date on recent significant developments. Each topic presented includes a separate discussion and conclusion. Changes in well and groundwater administration and developments are not included. The topics discussed include: transmounder discussed include: tain diversion, abandonment, changes in the course of a river, changes in the point of diversion, the necessity of a diversion, and proof of title to water rights. Those topics of long-term interest which have not undergone any significant modification during the decade are omitted. (Mockler-Florida) W73-13070

STRATEGIC UNCERTAINTY AND THE NA-TIONAL ENVIRONMENTAL POLICY ACT, Environmental Defense Fund, East Setauket,

primary bibliographic entry see Field 06B. W73-13148

POLLUTION ABATEMENT PROGRAMS IN THE DELAWARE RIVER ESTUARY, Delaware River Basin Commission, Trenton, N.J. For primary bibliographic entry see Field 05G. W73-13164

PROCEEDINGS OF CONFERENCE ON TOWARD A WATER RESOURCES RESEARCH PLAN FOR MINNESOTA. Minnesota Univ., St. Paul. Water Resources Research Center.

Mimeographed Report. May 1973. 50 p. OWRR A-999-MINN (28). 14-31-0001-3823.

Descriptors: *Water resources institute, Administration, *Minnesota, *Planning, *Research priorities, *Comprehensive planning, *Conferences, Research and development, Organizations. Identifiers: Water resources problem-research analyses, Research community.

The Minnesota Water Resources Research Center The Minnesota Water Resources Research Center is developing a long-range comprehensive plan for water resources research in Minnesota involving Federal, State and local agencies, private organizations, University of Minnesota, State and private Colleges, and others. An attempt is being made to formulate broad research guidelines and programs for coordinating research efforts. During fiscal year 1974, the Center will place a heavy emphasis on the analysis of important water resolutions. problems in Minnesota to determ ine defensible asproblems in Minnesota to determine detensible as-sociated research requirements, i.e., the research necessary to give a reasonable level of assurance that the problems can be resolved in a cost-effec-tive and timely fashion. A water resources problem-research analysis workshop conference program will be developed. The objective of this

Conference was to discuss matters associated with developing the water resources research plan, and developing the water resources research plan, and to devise ways and means for completing the plan. The following subjects were discussed: water resources research community in Minnesota, water resources problems in Minnesota and associated research needs, and Federal Water Pollution Control Act amendments and associated research opportunities. (Walton-Minnesota) W73-13303

ENVIRONMENTAL LEGISLATION: HOW IT AFFECTS FOSSIL-FUEL-FIRED POWER-GENERATING EQUIPMENT,
General Electric Co., Schenectady, N.Y.
N. R. Dibelius, and W. F. Marx.
Mechanical Engineering, Vol 95, No 3, p 76-80,
March 1973. 3 tab.

Descriptors: *Environmental control, *Regula-tion, *Administrative agencies, *Standards, *Elec-tric powerplants, Environmental engineering, Air pollution, Water pollution, Sound waves, Social aspects, Electric power production, Fossil fuels, Coals, Oil, Natural gas, Legal aspects, Federal government, State governments, Legislation, Water quality control.

nary is presented of federal developments A summary is presented of federal developments concerning air, water and noise pollution through November 1972. The Clean Air Act set up airquality-control regions for the achievement of national ambient air standards. Many federally approved state regulation plans contain emission limitations applicable to all steam generators of more than 250 million Btu per hour heat input and others cover gas turbines. per hour heat input and others cover gas turbines. These restrictions may affect the placement of power plants. Standards for particulate matter, sulfur dioxide, and nitrogen oxides emissions for gas-, oil-, and coal-fired power plants are presented. The recently enacted Water Pollution Control Act requires that power plants achieve, where possible, no discharge of pollutants. This affects the discharge of cooling water, boiler blowdown, and the use of certain cleaning techniques. down, and the use of certain cleaning techniques. Regulations under the Walsh-Healy Act and the Occupational Safety and Health Act govern the level of noise to which employees may be exposed over a period of time. A table indicates these levels. While each of these laws and regulations is important, they must be viewed as a whole to eval-uate their effect on a given facility. (Jerome - Van-derbill) derbilt) W73-13474

UPPER MISSISSIPPI RIVER COMPREHENSIVE BASIN STUDY, APPENDIX L.-FISH AND WIL-DLIFE RESOURCES.
Bureau of Sport Fisheries and Wildlife, Minneapolis, Minn.

For primary bibliographic entry see Field 06B. W73-13492

UPPER MISSISSIPPI RIVER COMPREHENSIVE BASIN STUDY, APPENDIX O-STATE AND FEDERAL WATER LAWS, POLICIES, AND PROGRAMS.

Corps of Engineers, Chicago, Ill. North Central Div.

For primary bibliographic entry see Field 06B. W73-13495

GROUNDWATER: FROM WINDMILLS TO COMPREHENSIVE PUBLIC MANAGEMENT, Nebraska Univ., Lincoln. School of Law. R. S. Harnsberger, J. C. Oeltjen, and R. J. Fischer. Nebraska Law Review, Vol 52, No 2, p 179-292, 1973. OWRR B-007-NEB (3), 14-31-0001-3301.

Descriptors: *Groundwater, *Water management (Applied), *Planning, *Nebraska, Withdrawal, Legal aspects, Riparian rights, *Irrigation.

This article is the second of three analyzing legal aspects of water resources planning in Nebraska. (See W73-00475 and W73-13506). This article describes groundwater utilization in Nebraska and analyzes some of its major problems. Despite increasing conflict between users, subternanean withdrawals have never been managed other than by the individual decisions of thousands of farm irrigators and domestic, industrial and municipal users. This contrasts sharply with the comprehensive scheme regulating stream diversions since 1895 which will be the focus of the last study in this series. W73-13505

RIGHTS TO NEBRASKA STREAMFLOWS: AN HISTORICAL OVERVIEW WITH RECOMMEN-

Nebraska Natural Resources Commission, Lin-

com.
R. J. Fischer, R. S. Harnsberger, and J. C. Oeltjen.
Nebraska Law Review, Volume 52, No 3, p 313376, 1973. OWRR B-007-NEB (4), 14-31-00013301.

Descriptors: "Water management (Applied), Planning, "Riparian rights, Appropriation, Stream-flow, Legal aspects, "Nebraska, "Prior appropria-tion, "Irrigation.

This article is the third of three analyzing legal aspects of water resources planning in Nebraska. (See W73-00475 and W73-13504). The chief purposes are to: (1) describe the present system of riparianism in Nebraska and show how it creates uncertainty and confusion; (2) recount the philosophy of the early settlers leading to passage of the Irrigation and Appropriation Act of 1892. philosophy of the early settlers leading to passage of the Irrigation and Appropriation Act of 1895, which remains the basic law governing water rights in natural watercourses; (3) depict the 1895 Act; and (4) propose several major modifications. W73.13506. W73-13506

THE PRESIDENT'S 1973 ENVIRONMENTAL

Council on Environmental Quality, Washington,

For primary bibliographic entry see Field 06G. W73-13528

GROUND-WATER CONTAMINATION AND LEGAL CONTROLS IN MICHIGAN, For primary bibliographic entry see Field 05B. W73-13562

AN ACT PROHIBITING THE POLLUTION DISCOLORATION, CONTAMINATION, CLOGGING, OR DIVERSION OF PUBLIC STREAMS.

Act No. 1199, Acts of Alabama, p 2078-2079, 1971.

Descriptors: "Alabama, "Legislation, "Water pol-lution sources, "Streams, "Water pollution con-trol, Pollutants, Sewage treatment, Water quality, Water treatment, Wastes, Water conservation, Local governments, Penalties (Legal), Water quality control, Administrative agencies, Adminis-trative decisions, Regulation, Permits.

In all counties having a population between 175,000 and 300,000, it shall be unlawful for any 1/3,000 and 300,000, it shall be unlawful for any person, firm, corporation or association to discharge, dispose or negligently to allow the deposit in the public streams of any wastes composed of raw sewage, industrial wastes or other wastes in such manner as to pollute, discolor, composed to the public streams unless the public streams unless. taminate, clog, or divert the public streams, unless the waste is first treated or processed in accordance with standards promulgated by the Alabama Water Improvement Commission. Penal-ties for violation of this act are included, and each day a violation continues it shall constitute a separate act. (Mockler-Florida)

Field 06-WATER RESOURCES PLANNING

Group 6F-Nonstructural Alternatives

6F. Nonstructural Alternatives

ATTITUDES OF RIPARIANS TOWARDS THEIR LAKE ENVIRONMENTS: A STUDY OF LAKE
WYOLA AND DAMON POND, MASSACHUSETTS,
Massachusetts Univ., Amherst. Dept. of Land-

scape Architecture.
For primary bibliographic entry see Field 06A.
W73-13007

ENVIRONMENTAL PROTECTION THROUGH PUBLIC AND PRIVATE DEVELOPMENT CON-

Pennsylvania Univ., Philadelphia. Inst. for Environmental Studies.

For primary bibliographic entry see Field 05G. W73-13025

6G. Ecologic Impact of Water Development

CHANGING TIMES FOR WATER RESEARCH AND TECHNOLOGY TRANSFER, Nebraska Univ., Lincoln. Water Resources Research Inst.

For primary bibliographic entry see Field 06B. W73-13038

WATER POLLUTION: ENVIRONMENTAL IM-PACTS AND MEANS OF CONTROL, Rutgers-The State Univ., New Brunswick, N.J. Water Resources Research Inst. For primary bibliographic entry see Field 05G. W73-13078

REACTIONS OF CANADA GEESE TO RESER-VOIR IMPOUNDMENT ON THE SNAKE RIVER IN WASHINGTON

Washington State Univ., Pullman. Dept. of Zoolo-

gy. L. W. Gibson, and I. O. Buss.

Northwest Science Vol 46, No 4, p 301-318, 1972. 5 fig, 3 tab, 30 ref. OWRR-A-054-WASH (1).

Descriptors: Ecology, Dams, *Geese (Wild), Ducks, *Waterfowl, Management, *Washington, *Canada goose, *Impoundments, Reservoirs. Identifiers: *Snake River (Wash).

A difficult aspect of river-development evaluation is the effect of dams upon wildlife. Currently a vast network of moderately sized dams is being constructed in the Pacific Northwest. Many of these dams, such as those completed and being completed on the Snake River in southwest Washington, create profound changes in the ecology of the entire region. Unfortunately, the need for pre- and post-impoundment research on such areas is usually realized too late. Vast changes in ecosystems occur without meaningful studies being conducted. This report is the latest of a continuous series of waterfowl studies, primarily con-cerning the great basin Canada goose Branta canadensis moffitti, conducted prior to, during, and after completion of a series of dams on the Snake River. The three objectives of this study are: (1) to evaluate ecological changes and their ef-fects on Canada goose nesting on the Snake River between Almota and Central Ferry, Washington, as dam construction inundated important breeding as dam construction inundated important orecaing sites, (2) to study various aspects of goose behavior based partly on marked geese, and (3) to study the use of artificial nesting structures under pre- and post-impoundment conditions. W73-13082

ENVIRONMENTAL APPLICATION OF REMOTE SENSING METHODS TO COASTAL

ZONE LAND USE AND MARINE RESOURCE MNAGEMENT, Virginia Univ., Charlottesville, Dept. of Environ-

mental Scien

mental Sciences.
For primary bibliographic entry see Field 02L. W73-13210

ENVIRONMENTAL IMPACT OF GEOTHER-MAL DEVELOPMENT.

Oregon State Dept. of Geology and Mineral Industries, Portland. R. G. Bowen.

In: Geothermal Energy-Resources, Production, Stimulation; Proceedings of Special Symposium of American Nuclear Society, June 19-20, 1972: Stanford University Press, Stanford, Calif, p 197-215, 1973. 3 fig. 22 ref.

Descriptors: *Environmental effects, *Geothermal studies, *Electric power, *Electric power demai studies, "Electric power, "Electric power de-mand, "Thermal powerplants, Electric power production, Hydrogeology, Water resources development, Energy, Steam turbines, Wells, Thermal pollution, Water pollution sources. Identifiers: "Geothermal power.

The geothermal plant is unique in that all of the steps in the fuel cycle are localized at the site of the power production facilities. In all other methods of power production, the environmental impact of the fuel cycle extends far beyond the bounds of the power generating plant. The chief impact from the use of geothermal power occurs during the period of development of the field and construction of the steam gathering lines and powerplants, but the impact is limited to the area of the field and poses nothing like the vast disruption of the landscape caused by mining the fuels for other thermal powerplants. During the productive lifetime of the geothermal field, which can extend over many decades, most of the source area can be used for other purposes. At Larderello, for example, where natural steam has been used to produce electricity for 60 years, farms, orchards, and vineyards cover much of the land surface. Natural steam does contain a small percentage of noncondensable gases that are vented to the air. But compared to the amounts dissipated by fossil fuel plants, these gases--mostly carbon dioxide but also nitrogen, hydrogen, methane, and hydrogen sulfide-are minor. Compared to the total gaseous release from all steps in the nuclear fuel cycle, the overall volume and toxicity of gases from the geothermal plant is, again, minor. (See also W73-13214) (Knapp-USGS)
W73-13224)

ENVIRONMENTAL ASPECTS OF NUCLEAR

STIMULATION, Utah Univ., Salt Lake City. Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 08H. W73-13230

CORROSION AND SCALING IN NUCLEAR--STIMULATED GEOTHERMAL POWER PLANTS, California Univ., Livermore. Lawrence Liver-

more Lab. For primary bibliographic entry see Field 08H. W73-13231

ECOLOGICAL EFFECTS OF OFFSHORE DREDGING AND BEACH NOURISHMENT: A

University of Southern Mississippi, Hattiesburg. For primary bibliographic entry see Field 05C. W73-13290

FINAL ENVIRONMENTAL STATEMENT RE-LATED TO OPERATION OF SURRY POWER STATION UNIT I. of Licensing (AEC), Washington, D.C.

For primar W73-13408 mary bibliographic entry see Field 05C.

FINAL ENVIRONMENTAL STATEMENT RE-LATED TO THE ST. LUCIE PLANT UNIT NO.

Directorate of Licensing (AEC), Washington, For primary bibliographic entry see Field 05C. W73-13410

FINAL ENVIRONMENTAL STATEMENT RE-LATED TO THE CONTINUATION OF CON-STRUCTION OF UNIT 2 AND THE OPERA-TION OF UNITS 1 AND 2 MILLSTONE NUCLEAR POWER STATION. Directorate of Licensing (AEC), Washington, D.C. nary bibliographic entry see Field 05C. For prin

FINAL ENVIRONMENTAL STATEMENT RE-LATED TO THE CONSTRUCTION OF SUSQUEHANNA STEAM ELECTRIC STATION

W73-13411

UNITS 1 AND 2 Directorate of Licensing (AEC), Washington,

For primary bibliographic entry see Field 05C. W73-13412

FINAL ENVIRONMENTAL STATEMENT RE-LATED TO CONSTRUCTION OF NINE MILE POINT NUCLEAR STATION UNIT 2. Directorate of Licensing (AEC), DC

For primar W73-13413 ary bibliographic entry see Field 05C.

ENERGY IMPLICATIONS OF SEVERAL EN-VIRONMENTAL QUALITY STRATEGIES, Oak Ridge National Lab., Tenn. ary bibliographic entry see Field 05G. For prin W73-13421

RESEARCH NEEDS ON WASTE HEAT TRANSFER FROM LARGE SOURCES INTO THE ENVIRONMENT.

Illinois State Water Survey, Urbana. For primary bibliographic entry see Field 05G. W73-1347

ENVIRONMENTAL LEGISLATION: HOW IT AFFECTS FOSSIL-FUEL-FIRED POWER-GENERATING EQUIPMENT,
General Electric Co., Schenectady, N.Y. For primary bibliographic entry see Field 06E. W73-13474

MAINTENANCE OF GREAT SOUTH BAY AND PATCHOGUE RIVER, NEW YORK, NAVIGA-TION PROJECT (FINAL ENVIRONMENTAL STATEMENT).

For primary bibliographic entry see Field 08B. W73-13524

THE PRESIDENT'S 1973 ENVIRONMENTAL Council on Environmental Quality, Washington, D.C. PROGRAM.

Available from GPO, Washington, D.C. 20402 Price \$5.05. April 1973. 585p.

Descriptors: "Comprehensive planning, "Land use, "Environment, Water pollution control, Farms, Air pollution, Legislation, Land resources, Valer resources, Land development, Land management, Natural resources, Parks, Ecology, United States.
Identifiers: *Environmental Program (1973).

A National Land Use Policy Act would authorize Federal assistance to encourage the States, in cooperation with local governments, to protect lands which are of critical environmental concern and to control major development, including airand to control major development, including airport and highway siting. Any state that fails to establish an acceptable land use program within three years from enactment would be subject to cumulative reductions of up to 21% of the funds allocated to the State under the Airport and Airway Development Act, the Federal-aid Highway Acts, including the Highway Trust Fund, and the Land and Water Conservation Fund. The major categories of the program are managing the Land categories of the program are managing the Land, expanding farm production, controlling pollution, and protecting our natural heritage. (Knapp-USGS) W73-13528

PROPOSED CENTRAL ARIZONA PROJECT (FINAL ENVIRONMENTAL STATEMENT).
AVAILABLE FROM THE NATIONAL TECHNI-CAL INFORMATION SERVICE AS EIS-AZ-72-5-337-F1. BUREAU OF RECLAMATION, BOULDER CITY, NEVADA. (FES 72-35) SEP-TEM BER 1972, 597 P. MAPS. 203 REF. Bureau of Reclamation, Boulder City, Nev. Region 3.
For primary bibliographic entry see Field 04A.
W73-13552

A CHEMICAL APPROACH TO THE PROBLEM OF ENVIRONMENTAL CONTAMINATION, P. Jotuni.

Suom Kemistil A. Vol 45, No 1, p 1-6. 1972. Illus. Identifiers: *Chemical studies, Contamination, Environmental effects, *Ecology.

A method for determining the elemental content in various envioronments and, at the same time, the situation before human activities started changing it is presented. Emphasis is on man's own elemenhas presented. Emphasis to many on recently all composition; also included are the composition of wood and water. The limiting factor is how the ancient material is found and dated.—Copyright 1973, Biological Abstracts, Inc.

07. RESOURCES DATA

7A. Network Design

LOSS OF INFORMATION BY DISCRETIZING HYDROLOGIC SERIES, Colorado State Univ., Fort Collins. Dept. of Civil

Engineering. M. Dyhr-Nielson.

Doctoral dissertation, May 1972. 134 p. 26 fig, 11 tab, 56 ref, append. OWRR-A-009-COLO (1).

Descriptors: *Hydrology, *Data Descriptors: Tryditology, Data Security of the Systems analysis.

Identifiers: *Information loss, *Discretization procedures, *Sampled data.

This study considers the use of discretized data as Ins study considers the use of discretized data as the basis for stochastic modeling of continuous hydrologic variables and processes. A procedure is presented for quantitative evaluation of the loss of information when parameters of continuous stochastic processes are estimated on the basis of discrete sampled data. Three discretization procedures are considered: (1) Discrete point sampling, where the process is sampled at periodic time intervals as a series of instantaneous values; (2) average sampling, where the process is sampled as a series of average values; and (3) quantization of the variable, where its values are pooled into class intervals. The decision theoretical.concept of 'expected information loss,' based on a linear loss function, is used as the measure of information content. For each discretization information content. For each discretization procedure, general expressions for the expected information loss in estimating mean, variance and autocovariance are found as functions of the dis-cretization interval, the length of the sampling period, and the mean, variance, and autocovariance of the continuous process. A streamflow seance of the commons process. A streamfor series is analyzed to show the applicability and potential of the approach. Average sampling introduces significant losses of information due to the biasing effect inherent in the sampling procedure. With the exception of the mean, a sample of instantaneous values contains more information with the exception of the mean, a sample of instantaneous values contains more information. mation about the parameters investigated than a sample of average values, taken over the same sampling interval. (Bell-Cornell) sampling in W73-13075

NATURAL REGIME HYDROLOGICAL NET-WORK PLANNING, A METHODOLOGICAL DISCUSSION, Waterloo Univ. (Ontario). For primary bibliographic entry see Field 06A. W73-13136

ERRORS OF MEASUREMENT, PRECISION, ACCURACY AND THE STATISTICAL COMPARISON OF MEASURING INSTRUMENTS, Army Ballistic Research Labs., Aberdeen Proving

F. E. Grubbs.

Technometrics, Vol 15, No 1, p 53-66, February 1973. 2 tab, 8 ref.

Descriptors: *Instrumentation. *Measurement. *Statistical methods, Laboratory equipment, Research equipment, Methodology. Identifiers: *Accuracy, *Precision, *Errors.

A very important and yet widely misunderstood concept or problem in science and technology is that of precision and accuracy of measurement. It is therefore necessary to define the terms preci-sion and accuracy (or imprecision and inaccuracy) sion and accuracy (or impression and naccuracy) clearly and analytically if possible. Also, we need to establish and develop appropriate statistical tests of significance for these measures, since generally a relatively small number of measurements will be made or taken in most investigations. A discussion is given of some of the pertinent literature for estimating variances in errors of measurement, or the 'imprecisions' of measurement, when two or three instruments are used to take the same observations on a series of items or characteristics. Also, present techniques for comparing the imprecision of measurement of one in-strument with that of a second instrument through the use of statistical tests of significance are reviewed, as well as procedures for detecting the significance of the difference in biases or levels of measurement of two instruments. Finally, methods are indicated of extending present theory to the case of three measuring instruments, for which rather sensitive statistical tests of significant control of the control nificance are developed for dealing with the precision and accuracy problem. An example for the three instrument case is given to illustrate the suggested methodology of analysis. (Mortland-Battelle) W73-13194

NETWORK DENSITY OF TEMPERATURE PROFILE STATIONS AND ITS INFLUENCE ON

THE ACCURACY OF LAKE EVAPORATION THE ACCURACY OF LAKE EVAPORATION CALCULATIONS, Oklahoma State Univ., Stillwater. Dept. of Agricultural Engineering. For primary bibliographic entry see Field 02D. W73-13365

7B. Data Acquisition

MEASUREMENT OF GROUNDWATER FLOW USING AN IN-SITU THERMAL PROBE, New Mexico Inst. of Mining and Technology, Socorro. Dept. of Geoscience. For primary bibliographic entry see Field 02F. W73-13013

DATA ACQUISITION SYSTEMS IN WATER QUALITY MANAGEMENT, Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 05G.
W73-13024

REGIME, THEORY, AND METHODS OF CAL-REGIME, THEORY, AND METHODS OF CAL-CULATION AND MEASUREMENT OF SEDI-MENTS AND WASTE WATERS (REZHIM, TEORIYA, METODY RASCHETA I 12-MERENTYA NANOSOV I STOCHNYKH VOD). Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02J.
W73-13045

STUDY OF SUSPENDED SEDIMENTS IN RESERVOIRS BY THE METHOD OF SPEC-TRAL DIFFUSIVITY (IZUCHENIYE VZ-VESHENNYKH NANOSOV V VODOK-HRANILISHCHAKH METODOM SPEKTRAL'-NOY YARKOSTI), Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02J.
W73-13052

AN IMPROVED QUICK-FIELD METHOD OF CALCULATING WASTE WATER DILUTION IN RIVERS (USOVERSHENSTVOVANIYE EK-SPRESS-METODA RASCHETA RAZ BAVLENIYA STOCHNYKH VOD V REKAKH), Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 05B.
W73-13054

TRANSIENT VIBRATION TECHNIQUES TO DETERMINE WAVE VELOCITIES IN-SITU, Kentucky Univ., Lexington. Dept. of Civil Engineering. For prima For primary bibliographic entry see Field 02G. W73-13055

DETERMINATION OF LOW PHOSPHATE CONCENTRATIONS IN SEAWATER BY AN ACETATE ISORUTVI. EXTRACTION PROCEDURE,
Osservatorio Geofisico Sperimentale, Trieste (Itar primary bibliographic entry see Field 05A. W73-13057

A NEW METHOD FOR DETERMINING THE TOTAL CARBONATE ION CONCENTRATION IN SALINE WATERS,
Lamont-Doherty Geological Observat
Palisades, N.Y.
For primary bibliographic entry see Field 02K. Observation.

Field 07-RESOURCES DATA

Group 78-Data Acquisition

THE POLAROGRAPHIC DETERMINATION OF TRACE AMOUNTS OF CYANIDE, Salford Univ. (England). Dept. of Chemistry and Applied Chemistry. For primary bibliographic entry see Field 05A.

WATER LOSS FROM CUT GRASS WITH SPE-CIAL REFERENCE TO HAY-MAKING, Volcani Inst. of Agricultural Research, Bet-Dagan (Israel). For primary bibliographic entry see Field 03F. W73-13119

DEVELOPMENTS IN APPLICATIONS OF REMOTE SENSING TO HYDROLOGIC MODELING, IBM Space Systems Center, Huntsville, Ala For primary bibliographic entry see Field 02E. W73-13146

POLARIZATION: A KEY TO AN AIRBORNE OPTICAL SYSTEM FOR THE DETECTION OF OIL ON WATER, National Aeronautics and Space Administration, Moffett Field, Calif. Amc. Research Center. For primary bibliographic entry see Field 05A. W73-13167

THE CALIBRATION AND RESPONSE OF ION--SELECTIVE ELECTRODES AT LOW CON-CENTRATIONS OF PRIMARY IONS, Technical Univ. of Budapest (Hungary). Inst. for General and Analytical Chemistry.
For primary bibliographic entry see Field 02K. W73-13188

RECENT RESULTS ON THE DYNAMIC RESPONSE OF PRECIPITATE-BASED ION-SELECTIVE ELECTRODES,
Technical Univ. of Budapest (Hungary). Inst. for

General and Analytical Chemistry.
For primary bibliographic entry see Field 02K. W73-13189

RUGGED SILVER-SILVER CHLORIDE

ELECTRODE FOR FIELD USE,
National Oceanic and Atmospheric Administration, Tiburon, Calif. Marine Minerals Technology

R. F. Corwin, and U. Conti. The Review of Scientific Instruments, Vol 44, No 6, p 708-711, June 1973. 7 fig, 14 ref.

Descriptors: *On-site data collections, trochemistry, Resisitivity, Salinity, Reliability, Temperature, Design.

Identifiers: *On-board analysis, *Marine environ-ment, *Silver/silver chloride electrode, *Electrochemical behavior, Ion selective electrodes, Shipboard measurements, Mechanical shock.

A rugged silver-silver chloride electrode has been developed and used successfully in a variety of field applications. The electrode housing is ma of 2.54 cm o.d. clear acrylic plastic rod. The filling solution is 2.7 M potassium chloride saturated with silver chloride, and contact with the external medium is made through a porous ceramic rod. Results of laboratory and field tests measuring the response of the electrode to chemical, thermal, mechanical, and electrical disturbances are presented. The electrode has provided relaible serduring both offshore and onshore use. (Holoman-Battelle) vice when subjected to severe mechanical abuse W73-13193

TION OF ORTHOPHOSPHATE AND POLYPHOSPHATES, Wisconsin Univ., Milwaukee. Center for Great Lakes Studies.

Lakes Studies.
For primary bibliographic entry see Field 05A.

ISOTOPHIC TRACER TECHNIQUES FOR IDENTIFICATION OF SOURCES OF NITRATE POLLUTION,
Tennessee Valley Authority, Muscle Shoals, Ala.

Div. of Agricultural Development.
For primary bibliographic entry see Field 05B. W73-13201

ENVIRONMENTAL APPLICATION REMOTE SENSING METHODS TO COASTAL ZONE LAND USE AND MARINE RESOURCE Virginia Univ., Charlottesville. Dept. of Environ-

mental Science ary bibliographic entry see Field 02L. For primar W73-13210

DETECTION OF FRESH WATER AQUIFERS IN GLACIAL DEPOSITS NORTHWESTERN MISSOURI BY GEOELEC-TRICAL METHODS, Missouri Univ., Rolla. Geophysical Observatory. For primary bibliographic entry see Field 04B. W73-13213

APPARATUS FOR SEMI-CONTINUOUS CUL-TURE OF DAPHNIA, For primary bibliographic entry see Field 05A. W73-13239

ATOMIC FLUORESCENCE SPECTROMETRY WITH A GRAPHITE ROD ATOMIZER AND THERMOSTATED ELECTRODELESS

Florida Univ., Gainesville. Dept. of Chemistry. For primary bibliographic entry see Field 05A.

ENZYME ELECTRODES, Utah Univ., Salt Lake City. Coll. of Engineering. For primary bibliographic entry see Field 05A. W73-13266

COLLABORATIVE STUDY COLLABORATIVE STUDY OF THE
NONAQUEOUS COPPER COLORIMETRIC
AND SILVER TITRIMETRIC METHODS FOR
THE DETERMINATION OF MALATHION IN
TECHNICAL GRADE MALATHION AND IN
MALATHION FORMULATION,
American Cyanamid Co., Princeton, N.J.
For primary bibliographic entry see Field 05A.
W72 12326. OF W73-13283

CHEMICAL COMPOSITION OF OCEAN USING A DIRECT MEASURING OCEANOGRAPHIC ELECTROCHEMICAL PROBE, California Univ., Los Angeles. Dept. of Geology. For primary bibliographic entry see Field 02K. W73-13294

IMPROVED WATER ANALYSIS KIT, Franklin Inst. Research Labs., Philadelphia, Pa. W. H. Collins.

w. r. Collins.

Available from the National Technical Informa-tion Service as AD-756 952, \$3.00 in paper copy, \$1.45 microfiche. Report Nos LWL-Ck-03B69, FIRL-F322-02/03, December 1972. 20 p, 12 fig, append. Contract No DAAD05-72-C-0113.

Descriptors: *Water analysis, *Water quality, Descriptors: *Water analysis, *Water quality, *Equipment, *On-site tests, *Testing procedures, *Instrumentation, *Water properties, On-site in-vestigations, Physical properties, Chemical pro-perties, On-site data collections, Chemical analy-sis, Hardness (Water), Alkalinity, Chlorides, Sulfates, Hydrogen ion concentration, Acidity, Flocculation, Turbidity, Methodology, Coagula-tion, Pollutant identification. Identifiers: Chlorine residual, Chlorine demand.

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An improved water test kit which is smaller in size and simpler to use and stock than Water Quality Control Set, FSN 6630-262-7288, Standard B, has been developed for the Army Land Warfare Laboratory. The kit has a minimum of glassware, weights 4 1/2 pounds, measures 9 X 6 X 6 inches and used techniques completely different than former methods. Eliminated is the need of preparing reagents, performing titrations and other tedinary tests and the state and the st ing reagents, performing titrations and other tedi-ous measurements. Most of the tests are conducted by dipping a paper or plastic strip into the water sample and reading the height of a column or comparing the color obtained to a chart. No complicated calculations are required. Water samples can be examined for pH, acidity, alkalinity, chlorine residual, chlorine demand, chloride, canonne residuat, chlorine demand, chloride, sulfate, turbdity and coagulation characteristics. Each kit contains enough material to examine at least 50 water samples for each of the above characteristics before requiring refill. The simplicity of the kit allows personnel with little or no training to use it effectively. (Holoman-Battelle) W73.1307

ON MULTIDISCIPLINARY RESEARCH ON THE APPLICATION OF REMOTE SENSING TO WATER RESOURCES PROBLEMS Wisconsin Univ., Madison. Inst. of Environmental Studies. For primary bibliographic entry see Field 05A. W73-13299

RADAR SOUNDING OF THE ABRAMOV GLA-CIER (RADIOLOKATSIONNOYE ZON-DIROVANIYE LEDNIKA ABRAMOVA), Sredneaziatskii N Gidrometeorologicheskii Nauchno-Issledovatelskii Institut. (USSR). For primary bibliographic entry see Field 02C. W73-13356

ON THE ANALYSIS OF 'SLUG TEST' DATA, Geological Survey, Washington, D.C. For primary bibliographic entry see Field 02F. W73-13369

MONITORING SNOW WATER EQUIVALENT BY USING NATURAL SOIL RADIOACTIVITY, National Weather Service, Silver Spring, Md. For primary bibliographic entry see Field 02C. W73-13382

NAVIFACIAL TEMPERATURE AND SALINITY ALONG THE TRACK FROM SAMOA TO HAWAII, 1957-1965, Stevens Inst. of Technology, Hoboken, N.J. For primary bibliographic entry see Field 02E.

MEASURING THERMAL PLUMES IN THREE DIMENSIONS, Westinghouse Electric Corp., Pittsburgh, Pa. For primary bibliographic entry see Field 05B. W73-13450

SPECTRA OF THE TEMPERATURE AND HU-MIDITY FLUCTUATIONS IN THE MARINE BOUNDARY LAYER, Commonwealth Scientific and Industrial Research Organization, Sydney (Australia).

J. Warner. Quarterly Journal of the Royal Meteorological Society, Vol 99, No 419, p 82-88, January 1973. 4 fig. 2 tab. 12 ref.

Descriptors: *Atmospheric physics, *Boundary layers, *Convection, *Air temperature, *Air circulation, Meteorology, Maritime air masses, Wind velocity, Measurements, Evaluation, Aircraft, Air-water interfaces, Oceans, Mixing, Humidity.

Results are discussed of measurements of temperature and humidity made from an aircraft in 61 runs at heights of 30 to 550 meters over the open sea in conditions of active convection with mean mind speeds between 4.5 and 9.5 M/S. The intensity of the fluctuations of temperature and humidity in different conditions is examined and compared to other data. The scaled values of the fluctuations of temperature and mixing ratio are consistent with the law appropriate to free convection for scaled heights up to 2; at higher levels there is less evidence for a change with height. While the virtual potential temperature fluctuations in terms of Deardorff's temperature scale decreased somewhat with scaled height in terms of depth of the convection layer, their magnitude at all heights is much greater than predicted. It is possible that the mixing at the upper boundary is important in determining the magnitude of the fluctuations in virtual potential temperature right down to the surface. The spectra obeyed the -5/3 power law for dimensionless frequencies in excess of about 0.3. (Jerome-Vanderbilt)

AUTOMATED WATER MONITORING INSTRU-MENT FOR PHOSPHORUS CONTENTS, Nuclear Corp. of America, Denville, N.J. Nuclear

For primary bibliographic entry see Field 05A.

IMPROVED MERCURY WELL FOR MULTI-PLE TENSIOMETER SYSTEMS,

Agricultural Research Service, Mandan, N. Dak. Soil and Water Conservation Research Div. E. J. Doering, and J. P. Harms.

Soil Sci Soc Am Proc. Vol 36 No 5, p. 849-850. 1972, Illus. dentifiers: *Manometer, *Mercurywell, Moisture, Soils, *Tensiometers.

Details are presented for the fabrication of an improved mercury well for multiple tensiometer systems. The well is mounted on the back of the manometer support and is so designed that individual manometers can be reparied without disturbing the other manometers. Scale zero is visible and low moisture tensions can be read.—Copyright 1973, Biological Abstracts, Inc. W73-13523

A SEDIMENT SQUEEZER FOR REMOVAL OF PORE WATERS WITHOUT AIR CONTACT, California Univ., Los Angeles. Dept. of Geology. For primary bibliographic entry see Field 02J. W73-13531

A VIBRATORY CORING SYSTEM FOR CON-TINENTAL MARGIN SEDIMENTS, Rhode Island Univ. Kingston. Graduate School of Oceanography. For primary bibliographic entry see Field 02J. W73-13532

AN ELUTRIATOR METHOD FOR PARTICLE-SIZE ANALYSIS WITH QUANTITATIVE SILT FRACTIONATION,

FRACTIONATION, Illinois State Geological Survey, Urbana. For primary bibliographic entry see Field 02J. W73-13533 A SPLITTER FOR UNCONSOLIDATED CORES TAKEN IN PLASTIC LINERS, Rosenstiel School of Marine and Atmospheric Sciences, Miami, Fla. For primary bibliographic entry see Field 02J. W73-13535

SIEVE LOAD EQUATIONS AND ESTIMATES OF SAMPLE SIZE, California State Univ., Sacramento. Dept. of Geology. For primary bibliographic entry see Field 02J. W73-13536

USE OF A NEUTRON MOISTURE PROBE TO DETERMINE THE STORAGE COEFFICIENT OF AN UNCONFINED AQUIFER, Geological Survey, Garden City, Kans. For primary bibliographic entry see Field 04B. W73-13554

A PERISCOPE FOR THE STUDY OF BOREHOLE WALLS, AND ITS USE IN GROUND-WATER STUDIES IN NIAGARA COUNTY, NEW YORK, Geological Survey, Washington, D.C. For primary bibliographic entry see Field 04B. W73-13555

A PORTABLE SAMPLER FOR COLLECTING WATER SAMPLES FROM SPECIFIC ZONES IN UNCASED OR SCREENED WELLS, Geological Survey, Ocala, Fla. For primary bibliographic entry see Field 04B. W73.1357.

DESCRIPTION AND USE OF AN UN-DERWATER TELEVISION SYSTEM ON THE ATLANTIC CONTINENTAL SHELF, Geological Survey, Washington, D.C. R. D. Laura, and M. A. Idnani. Plant Soil. Vol 37, No. 2, p. 283-295, 1972. Illus.

Descriptors: Logging (Recording), *Underwater, *Continental shelf, *Georgia, Continental slope, Exploration, Geologic investigations, *Photography, Coasts.
Identifiers: Decomposition, Flocculation, *Manures, Microbial studies, *Nitrogen, Pentizing

laphy, Coass: Decomposition, Flocculation, *Manures, Microbial studies, *Nitrogen, Peptizing reactions, Phosphates, *Slurry, Urea, *Wheat yield.

The use of liquid spent-slurry gave higher wheat yield and more N uptake than sun-dried slurry. The depressing effect of sun-drying on available N in slurry was attributed to enhanced irreversibility of the flocculative and peptizing reactions of organic colloidal matter due to desiccation and thus increased resistance to subsequent microbial decomposition and mineralization of slurry N. The absorption of liquid slurry in organic absorbents like green leaf powder, dry leaf powder, and sawborption in inorganic absorbents like charcoal dust and ash did not increase wheat yield, but N uptake was somewhat higher than sun-dried slurry. Like ordinary farm compost, the composts prepared by composting liquid slurry with wheat straw and sorghum stover gave lower yield and low N uptake. The enrichment of slurry with urea and superphosphate gave a manure which has a higher manurial value than (NH4)2SO4 on equivalent N basis.—Copyright 1973, Biological Abstracts, Inc. W73-13559

UNDERGROUND SURVEYS WITH BOREHOLD CAMERAS,
Pennsylvania Drilling Co., Pittsburgh.
For primary bibliographic entry see Field 04B.

WATER: EXAMINATION, ASSESSMENT, CON-DITIONING, CHEMISTRY, BACTERIOLOGY, BIOLOGY, For primary bibliographic entry see Field 05A. W73-13573

APPARATUS FOR REMOTE CENTRALIZED MEASUREMENT OF SOIL HUMIDITY BY THE ELECTROMETRIC METHOD, (IN ITALIAN), Turin Univ. (Italy). Istitute di Agronomia Generale e Coltivazioni Erbacce.
For primary bibliographic entry see Field 02G. W73-13582

A BATTERY DRIVEN MEASURING AP-PARATUS FOR THE ELECTRICAL REGISTRA-TION OF EVAPORATION OR DEWFALL, (IN GERMAN), Innsbruck Univ. (Austria). Institut Allgemeine Botanik. For primary bibliographic entry see Field 02D. W73-13619

7C. Evaluation, Processing and Publication

DETERMINATION OF OPTIMAL MULTIPLE USES OF A SMALL WATER RESOURCE, Massachusetts Univ., Amherst. Water Resources Research Center. For primary bibliographic entry see Field 06A. W73-13009

IN BUSH

HYDRA: DYNAMIC MODEL FOR URBAN HYDROLOGIC SYSTEMS, Nebraska Univ., Lincoln. Dept. of Computer Science. For primary bibliographic entry see Field 04A. W73-13012

EVALUATION OF TECHNIQUES FOR DETER-MINING AVERAGE PRECIPITATION IN SEMTARIO VALLEYS OF IDAHO, Idaho Univ., Moscow. Dept. of Civil Engineering. For primary bibliographic entry see Field 02B. W73-13028

FINITE ELEMENT SOLUTION TO UNCON-FINED GROUNDWATER FLOW WITH INFIL-TRATION, Rhode Island Univ., Kingston. Dept. of Civil Engineering. For primary bibliographic entry see Field 05B. W73-13031

SOME PROBLEMS IN STOCHASTIC HYDROLOGY, Texas Univ., Austin. Center for Research in Water Resources. For primary bibliographic entry see Field 02A. W73-13039

WATER LEVELS AND SPRING DISCHARGES FOR SELECTED WELLS AND SPRINGS IN NEVADA, 1966-69, Geological Survey, Lakewood, Colo. For primary bibliographic entry see Field 04B. W73.13048.

USE OF COMPUTERS TO COMPUTE UN-STEADY WIND CURRENTS IN BODIES OF WATER AS ILLUSTRATED BY LAKE BAYKAL (PRIMENENIYE EVM DLYA RASCHETA NEUSTANOVIVSHIKHSYA VETROVYKH TECHENIY V VODOYEMAKH (NA PRIMERE OZ. BAYKAL)), GOSUĠARSTVENIYI GIGTOLOGICHESKII Institut, Leningrad (USSR).

Field 07—RESOURCES DATA

Group 7C—Evaluation, Processing and Publication

For primary bibliographic entry see Field 02H.

WATER RESOURCES DATA FOR TEXAS, 1972: PART 1, SURFACE WATER RECORDS.
Geological Survey, Austin, Tex. Water Resources

Basic Data Report, 1973. 625 p. 1 fig, 3 ref.

Descriptors: *Hydrologic data, *Surface waters, *Texas, *Basic data collections, *Streamflow, Gaging stations, Flow rates, Low flow, Peak discharge, Reservoirs, Lakes, Water supply.

Surface-water records for the 1972 water year for Texas, including records of streamflow or reservoir storage at gaging stations, partial-record sta-tions, and miscellaneous sites, are presented Records for a few pertinent gaging stations in bor-dering States also are included. These data represent that portion of the National Water Data System collected by the U.S. Geological Survey and cooperating State and Federal agencies in Texas. The tables of data include a description of the gaging station, and daily, monthly, and yearly discharges of the stream. The description of the discharges of the stream. The description of the station gives the location, drainage area, records available, type and history of gage, average discharge, extremes of discharge, and general remarks. For most gaging stations on lakes and reservoirs a description of the station and a monthly summary table of stage and contents are given. Data for partial-record stations include measurements at low-flow partial-record stations and annual maximum stage and discharge at crest-stage stations. (Woodard-USGS)

A MINIMUM COST WATER DISTRIBUTION

NETWORK, Michigan Univ., Ann Arbor. Dept. of Environ-mental and Industrial Health. For primary bibliographic entry see Field 04A. W73-13071

DESIGN OF OPTIMAL WATER DISTRIBUTION USING DYNAMIC NETWORKS GRAMMING

Michigan Univ., Ann Arbor. Dept. of Environ-mental and Industrial Health. For primary bibliographic entry see Field 04A. W73-13072

AN INTERACTIVE DESIGN SYSTEM FOR WATER DISTRIBUTION NETWORKS, Michigan Univ., Ann Arbor. Dept. of Environ-mental and Industrial Health. For primary bibliographic entry see Field 04A. W73-13073

COMPUTER PROGRAMS IN HYDROLOGY. Minnesota Univ., Minneapolis. St. Anthony Falls Hydraulic Lab.

Hydraunc Lab. C. E. Bowers, A. F. Pabst, and S. P. Larson. Project Report No 124, June, 1971. 182 p, 31 fig, 5 tab, 37 ref. OWRR-A-020-MINN (3).

Descriptors: "Computer programs, "Hydrology, Water resources, "Projects, "Design, "Mathematical models, "Reviews, Hydrographs, Floods, Surface waters, Optimization, Simulation analysis, Streamflow, Routing, Reservoirs, River basins, Lakes, Electronic Streamflow, Polytones and Page 19 November 2019 Streamflow, Routing, Reservoirs, Runoff, Dams, Watersheds (Basins), Open channels, Hydraulics, Probability, Distribution, Statistical methods, Model studies, Rainfall-runoff relationships, Systems analysis.

Identifiers: Federal agencies, Source decks, Listings, Loss rate, Root river (Houston), Log-Pearson type method.

Research efforts in hydrology and hydraulic engineering have resulted in the development of many computer programs. Available programs in hydrology were reviewed with the aim of assisting in the application of these programs by potential users. The primary focus is upon programs which will be used for design purposes (as well as research), and programs based on well-known procedures which as a result have immediate application to design problems. Many of these projections to design problems. plication to design problems. Many of these pro-grams are available for use by other agencies, or-ganizations, and individuals. Problems associated with adapting programs to a given computer and with understanding the technical procedure on which the program was based are discussed. Numerous computer programs are describ merous computer programs are described, most of which were run on a CDC 6600 digital computer. General conclusions are given, including sug-gestions to those who might make use of the types of computer programs included in the study. Finally, an annotated bibliography covering a variety of topics in hydrology for which computer programs are of interest, and a list of computer programs developed by various organizations are presented. (Bell-Cornell)

INTERNATIONAL SYMPOSIUM ON UNCER-TAINTIES IN HYDROLOGIC AND WATER RESOURCE SYSTEMS, VOL. II. For primary bibliographic entry see Field 04A. W73-13134

PROBLEMS OF ANALYTICAL METHODS IN HYDROLOGIC DATA COLLECTIONS, Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.

I. Rodriguez-Iturbe, E. H. Vanmarcke, and J. C.

In: Proceedings (Vol. II), International Symposium on Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tucson, December 11-14, 1972. p 451-472, (1972) 1 fig, 2 tab, 12 ref.

Descriptors: Hydrology, "Hydrologic data, "Data collections, "Analytical techniques, Estimation, Correlation analysis, Design, Costs, Optimization, Equations, Networks, Size, Time. Identifiers: Multidimensional processes, Stationarity, Bayesian methods, Random sampling, Global, Local.

General techniques are discussed for evaluation of the accuracy of hydrologic data collection systems. Presented is a discussion of multidimen-sional correlation functions from a genetic point of view. Hydrologic data is generally insufficient to discriminate among several correlation functions which supposedly describe the process in space; meetheless the sampling requirements for a fixed accuracy may significantly vary from one function to the other making advisable a study of the genetic characteristics of these correlation functions. A general framework is presented for the estimation of spatial averages over a certain area. It is shown that the variance of the average de-It is shown that the variance of the average de-pends on the spatial correlation, the geometry and size of the sampling network and the size of the area considered. Quantitative examples are given for estimating the number of stations with dif-ferent sampling geometries. The time dimension is then introduced into the previous scheme allowing a quantitative evaluation of the old problem of time-vs-space trade in hydrologic networks. The assumption of stationarity is discussed, finally. A much weaker assumption of 'stationary increments' seems sufficient for the spatial process, allowing hydrologists to deal with regions where there exists a linear drift in the mean value of the process. (See also W73-13134) (Bell-Cornell) W73-13135

AN ANALYSIS OF SAMPLING-FREQUENCY ALTERNATIVES FOR FITTING A DA STREAM-TEMPERATURE MODEL, Geological Survey, Washington, D.C. For primary bibliographic entry see Field 04A. W73-13142

INFORMATION CONTENT OF THE RE-GIONAL MEAN, Pittsburgh Univ., Pa. Dept. of Civil Engineering. For primary bibliographic entry see Field 02A.

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THE MARGIN OF SAFETY FOR COMPENSAT-ING LOSSES DUE TO UNCERTAINTIES IN HYDROLOGICAL STATISTICS, Research Inst. for Water Resources Development, Budapest (Hungary). For primary bibliographic entry see Field 06B. W73-13157

UNCERTAINTY IN THE RETURN PERIOD OF MAXIMUM EVENTS: A BAYESIAN AP-PROACH. a Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 02B.

CONCERNING THE CALCULATION OF LEVEL VERIATION OF CUTOFF WATER BALANCE, Gruzinskii Nauchno-Issledovatelskii Institut Gidrotekhniki i Melioratsii, Tiflis (USSR). For primary bibliographic entry see Field 04A.

SOME PROBLEMS ASSOCIATED WITH THE ANALYSIS OF MULTIRESPONSE DATA, Wisconsin Univ., Madison. G. E. P. Box, W. G. Hunter, J. F. MacGregor, and

J. Erjavec. Technometrics, Vol 15, No 1, p 33-51, February 1973. 3 fig, 4 tab, 8 ref.

Descriptors: *Statistical methods, *Chemical analysis, Estimating, Kinetics, Mathematical models. Identifiers: *Data interpretation, Multiresponse data, Linear dependencies, Nonlinear models, Multivariate analysis, Errors.

Unless special care is exercised in analyzing multiresponse data serious mistakes can be made. tiresponse data serious mistakes can be made. Some problems associated with fitting mul-tiresponse models are identified and discussed. In particular, three kinds of dependencies are con-sidered: dependence among the errors, linear de-pendencies among the expected values of the responses, and linear dependencies in the data. Since ignoring such dependencies can lead to dif-ficulties, a method is described for detecting and handling them. The concepts involved are illus-trated with a chemical example. (Mortland-Bat-telle) W73-13195

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1968: PART II. PACIFIC SLOPE BASINS IN CALIFORNIA. Geological Survey, Washington, D.C. For primary bibliographic entry see Field 02K. W73-13200

DECISION MAKING IN WATER RESOURCE DECISION MARITO A.
ALLOCATION,
Oregon State Univ., Corvallis. Dept.
Anthropology.
For primary bibliographic entry see Field 06B. Univ., Corvallis. Dept. of

STREAMFLOW DATA USAGE IN WYOMING, Wyoming Univ., Laramie. Water Resources Research Inst.

Water Resources Series No. 33, February 1973. 12 p, 4 tab, 17 ref. OWRR A-001-WYO (65).

Descriptors: Data systems, Hydrology, Networks, Runoff, Stream gage, *Wyoming, *Streamflow, *Hydrologic data.

While several kinds of hydrologic studies are commonly made, high-flow studies are the most numerous. A survey of organizations making hydrologic studies in Wyoming shows that most organizations make high-flow studies, while low-flow and water availability studies are made by flow and water availability studies are made by only one-half of those organizations. Several models of runoff are in existence, with most of them being developed. Numerous methods of esti-mating streamflow are used, which points to the need for more streamflow observations; but economic limitations on data collection require that estimations continue to be made. W73.13306.

DESCRIPTION OF GLACIER RECESSION IN THE AMU-DAR'YA RIVER BASIN FROM AERIAL PHOTOGRAPHIC SURVEY DATA FOR 1946-66 (KHARAKTERISTIKA OTSTU-PANIYA LEDNIKOV BASSEYNA R. AMUDAR'I PO MATERIALAM AEROFOTOS'YEMKI 1946-

-1966 GG.), Sredneaziatskii Nauchno-Issledovatelskii ii Institut, Tashkent frometeorologicheskii (USSR).

ary bibliographic entry see Field 02C. For primar W73-13359

USE OF CROSS CORRELATION BETWEEN HYDROLOGICAL TIME SERIES TO IMPROVE ESTIMATES OF LAG ONE AUTOREGRESSIVE

PARAMETERS, Institute of Hydrology, Wallingford (England). J. Frost, and R. T. Clarke.

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Water Resources Research, Vol 9, No 4, p 906-917, August 1973. 2 tab, 23 ref.

Descriptors: "Statistical methods, "Correlation analysis, "Time series analysis, "Regression analysis, Hydrologic data, Synthetic hydrology, Statistical models. Identifiers: "Cross correlation.

In a serially correlated hydrologic time series (y) data may also be available from a longer time series (x), itself serially correlated and cross correlated with (y). On the assumption that both series are lag one autoregressions, large-sample variances for the autoregressive parameter are derived from the short series alone or from both series, and the relative information was investigated nu-merically. When the two serial correlations are approximately equal and the length of (x) is twice that of (y), the gain in precision is about 4% when the cross correlation is 0.2, about 15% when the cross correlation is 0.4, about 31% when the cross correlation is 0.6, and 49% when the cross correla-tion is 0.8. The equations giving maximum likelihood (ML) estimates are examined, and a relatively simple numerical technique is developed for one particular case of some practical importance. The modified Matalas estimates have naller mean square error than ML estimates, and ML estimates derived from both series have smaller mean square error than ML esti derived from the single series only. (Knapp-USGS) W73-13364

DYNAMIC COOLING. For primary bibliographic entry see Field 05B. W73-13449

MAP SHOWING RANGES IN PROBABLE MAX-IMUM WELL YIELD FROM WATER-BEARING ROCKS IN THE SAN FRANCISCO BAY RE-GION, CALIFORNIA, Geological Survey, Menlo Park, Calif. D. A. Webster. Miscellaneous Field Studies Map MF-431, 1972. 1 sheet. 4 map. 1 tab. 27 ref.

sheet, 4 maps, 1 tab, 27 ref.

Descriptors: *Water yield, *Groundwater, *Hydrogeology, *California, *Maps, Transmis-sivity, Aquifer characteristics, Drawdown, Water Identifiers: *San Francisco Bay region.

This map presents generalized information regarding the probable maximum yields of wells in the rocks of the San Francisco Bay region. It is intended to serve the needs of planners and other persons seeking general information on potential yields from water wells. Potential yield of wells is combatened as a service of the consideration in all price for water or the consideration in all price for water or the consideration in all price for water or the consideration in all price for water or the consideration in all price for water or the consideration in all price for water or the consideration in all prices for water or the consideration in all prices for water or the consideration in the con yields from water wells. Potential yield of wells is only one consideration in planning for water development. The history of land subsidence in the Santa Clara Valley resulting from overpump-ing and of bay-water intrusion of aquifers supply-ing wells in parts of Alameda and Contra Costa Counties, for instance, make evident the need to consider planned rates of pumping throughout areas of large well yields. (Knapp-USGS) W73-13519

MAPS SHOWING AREAS IN THE SAN FRANCISCO BAY REGION WHERE NITRATE, BORON, AND DISSOLVED SOLIDS IN GROUND WATER MAY INFLUENCE LOCAL OR REGIONAL DEVELOPMENT,

Geological Survey, Washington, D.C. D. A. Webster.

Miscellaneous Field Studies Map MF 432, 1972. 8 p, 5 maps, 34 ref.

Descriptors: *Water quality, *Groundwater, *California, Nitrates, Boron, Dissolved solids, Water resources development, *Maps. Identifiers: *San Francisco Bay region.

Information is provided on the nitrate, boron, and dissolved-solids content of groundwater in the San Francisco Bay region. Places where nitrate in groundwater has exceeded 45 mg per liter, where boron has exceeded 1 mg per liter, and where dis-solved solids have exceeded 2,000 mg per liter are shown on the maps by symbols. Areas where the maximum concentration of dissolved solids in maximum concentration of dissolved solids in groundwater generally has been less than 500 mg per liter, 500 to 1,000 mg per liter, and greater than 1,000 mg per liter, and areas for which readily available chemical quality data are lacking, are outlined. Changes in the specific conductance and approximate dissolved-solids content of groundwater at 66 wells are shown by graphs for 1960-70. (Knapp-USGS)
W73-13520

FLOOD OF MARCH 19-20, 1970, METROPOLITAN BIRMINGHAM AND JEF-FERSON COUNTY, ALABAMA, Geological Survey, University, Ala.

K.W. Causseaux. Alabama Geological Survey Atlas Series 2, 12 sheets, 1971. 7 fig, 5 photo, 9 map.

Descriptors: *Floods, *Alabama, *Maps, *Flood stages, *Historic floods, Mapping, Water levels, Rainfall, Flood recurrence interval, Flood profiles. Identifiers: *Flood maps, *Jefferson County (Ala).

A heavy rainstorm which included many intensive A heavy ranstorm which included many intensive local bursts moved eastward across north-central Alabama during the morning of March 19, 1970. According to information gathered immediately after the storm, including reports from several long-time residents, it was the greatest storm in many years; in Jefferson County the highest stages of record occurred at most stream-gaging stations. Moderate to extensive flooding occurred across the State, but the greatest property damage was in Birmingham and Jefferson County. Hydrologic data collected by the U.S. Geological Survey in cooperation with the Geological Survey of Alabama during and immediately after the storm are presented. Information is shown on a series of mars denicting the extent of areas invaded to are presented. Information is shown on a series of maps depicting the extent of areas inundated by the flooded streams in metropolitan Birmingham, and the flood event is described in terms of rainfall, streamflow, and flood elevations. This report provides public agencies and private individuals with factual data for solving flood problems and planning effective utilization of land adjacent to streams. (Knapp-USGS) W73-1352! W73-13521

A DIGITAL REGISTRATION SYSTEM FOR NET PHOTOSYNTHESIS AND TRANSPIRA-TION MEASUREMENTS IN THE FIELD AND AN ASSOCIATED ANALYSIS OF ERRORS, Wuerzburg Univ. (West Germany). Botanisches

For primary bibliographic entry see Field 02D. W73-13597

08. ENGINEERING WORKS

8B. Hydraulics

DESIGN OF EXPERIMENTS FOR ESTIMATING PROCESS DYNAMICS, Queen's Univ., Kingston (Ontario). Dept. of

Mathematics.
For primary bibliographic entry see Field 04A.
W73-13147

HYDROLOGIC AND HYDRAULIC DESIGN UNDER UNCERTAINTIES,

UNDER UNCERTAINTIES, Illinois Univ., Urbana. Dept. of Civil Engineering. W. H. Tang, and B. C. Yen. In: Proceedings (Vol. II), International Symposi-um on Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tuc-son, December 11-14, 1972, p 868-882, (1972). 3 fig. 1 tab. 20 ref.

Descriptors: Hydrology, "Hydraulics, "Design, Engineering, "Projects, Methodology, Probability, Design flow, Equations, Pipes, Reliability, Model studies, Systems analysis, "Risks. Identifiers: Risk level, Storm sewers, Precipitation

Uncertainties arise in various aspects and phases Uncertainties arise in various aspects and phases of hydrologic and hydraulic design of engineering projects. Previously, only hydrologic uncertainties such as basic randomness in flood or rainfall frequencies has been considered. A practical model is proposed through which all sources of uncertainties associated with a hydraulic design, including design model reliability, insufficient data, material variability, as well as hydrologic randomness etc., can be systematically analyzed, combined, and incorporated into the evaluation of the overall risk of alternative designs. Formulation leading to the selection of a design for a specified leading to the selection of a design for a specified risk level is developed. In this approach, the conventional measure of risk based on frequency analysis would constitute only a part of this overall risk. An example of storm sewer design is presented to illustrate in detail the proposed forpresented to illustrate in detail the proposed formulation. Based on the assessment of uncertainties, the precipitation rate and the errors in the simplified design model are the major sources of uncertainty. A risk-based sewer pipe design curve is developed for practical purpose. For a specified risk level of 1%, the required safety factor in the design flow is shown to be about 2.0. (See also W73-13134) (Bell-Cornell) W73-1319.

Field 08-ENGINEERING WORKS

Group 8B—Hydraulics

OPTIMAL DESIGN STRATEGY FOR SMALL FLOOD-CONTROL STRUCTURES,

FLOOD-CONTROL STRUCTURES, Queen's Univ., Kingston (Ontario). W.E. Watt, and K. C. Wilson. In: Proceedings (Vol. II), International Symposi-um on Uncertainties in Hydrologic and Water Resource Systems, University of Arizona, Tuc-son, December 11-14, 1972. p 903-916, (1972), 3

Descriptors: "Flood control, "Structures, "Design, "Economic efficiency, "Optimization, Estimating, Costs, Equations, Mathematical models, Systems analysis, "Risks. Identifiers: "Economic analysis.

An optimal design strategy for use on a regional basis for small flood-control structures is presented. When a large number of such small structures is to be built on independent drainage basins, the total expenditure may be very large, and it is of considerable advantage to investigate the optimization process on the basis of a regional aggregate. A mathematical model is presented which is extended in two stages. First, an optimum design strategy is obtained for the 'perfect knowledge' case, assuming that economic efficiency is the objective. This strategy leads to the determination of an optimum design return period, which is a function of the exponents of the two regional cost equations, the ratio between the cost of a typical damage event and the construction cost, the effective rate and other parameters. Second, a modified strategy is developed for the 'real world' case where the uncertainities in the various parameters combine to give an overall uncertainity case where the uncertainties in the various parameters combine to give an overall uncertaintiy in estimating the optimum. It is found that the penalty resulting from an underdesign caused by this uncertaintity is greater than that for an equivalent overdesign, and hence the 'real world' optimum should be larger than the estimated 'perfect knowledge' value. This increase is related to the degree of uncertainty and expressed in the form of overdesign factors applicable to discharge and return period. (See also W73-13134) (Bell-Cornell) nell) W73-13161

CONVECTIVE INSTABILITY IN LIQUID POOLS HEATED FROM BELOW, Washington Univ., Seattle. Dept. of Chemical En-Washington
gineering.
H. J. Palmer, and J. C. Berg.
Journal of Fluid Mechanics, Vol 47, Part 4, p. 779787, 1971. 5 fig, 2 tab, 9 ref.

Descriptors: *Heat transfer, *Convection, *Fluid mechanics, Buoyancy, Friction, Heat flow, Heat resistance, Stability, Laboratory tests, Tempera-Identifiers: Convective instability Thermistors

The linear hydrodynamic stability analysis of liquid pools heated from below combining surface tension and buoyancy effects as presented by Nield (1964) is confirmed by experiment for a series of silicone oils. The experimental method is an adaptation of the Schmidt-Milverton technique, in adaptation of the Schmidt-Milverton technique, in which the stability limit is located by the change of slope in the plot of heat flux versus temperature drop across the liquid pool. (Oleszkiewicz-Vanderbilt)

THERMALLY-DRIVEN LINEAR VORTEX, Florida State Univ., Tallahassee, Dept. of Mathe-

matics.
S. Blumsack, and A. Barcilon.
Journal of Fluid Mechanics, Vol 48, Part 4, p. 801-814, 1971. 2 fig, 1 tab, 8 ref.

W73-13442

Descriptors: *Heat transfer, *Vortices, *Velocity, *Mathematical models, Temperature, Shear, Shear stress, Coriolis Force, Hydraulics, Hydro-static pressure, Mathematical studies. Identifiers: Ekman numbers, Rossby numbers, Multi-boundary-layer structure.

Steady axially symmetric small Rossby number flows in which the driving consists of prescribed axial heat sources have been investigated. By letting the velocity be proportional to the shear at the bottom surface, the effects of that boundary condition on the resulting flows were studied. A multi-boundary-layer structure is found in the core, surrounding the heat sources. That structure depends on the relative magnitudes of the aspect ratio, stratification parameter and Ekman number. (Oleszkiewicz-Vanderbilt)

UNBOUNDED STRATIFIED FLOW OVER A

VERTICAL BARRIER, Case Western Reserve Univ., Cleveland, Ohio, of Fluid, Thermal and Aerospace Sciences. G. S. Janowitz.

Journal of Fluid Mechanics, Vol 58, No 2, p. 375-

388, 1973. 2 fig. 9 ref.

Descriptors: *Streams, *Stream flow, *Mathematical models, *Stratified flow, Fluid mechanics, Hydraulic engineering, Model studies, Equations, Hydrologic equations, Proude number, Barriers, Forecasting.

The horizontal, linearly stratified, non-diffusive, high Reynolds number flow of an unbounded fluid over a two-dimensional vertical barrier is studied for a range of internal Froude numbers under Oseen and Boussinesq approximations. For Froude numbers >0.47 the most prominent feature of the flow is the system of large amplitude lee waves located downstream of the barrier with crests tilted in an upstream direction. For Froude numbers between 0.47 and 0.6 the crests actually numbers between 0.47 and 0.6 the crests actually extend upstream of the barrier and appear as flows of alternating direction over the barrier. For Froude numbers between 0.47 and 0.5 reversed flows due to these waves actually extend far upstream. For Froude numbers <0.47 a blocking column upstream of the obstacle, as well as large amplitude lee waves, is present. For even smaller Froude numbers the amplitude of the lee-wave system diminishes but the blocking column remains. It is also shown that the steady-state solution obtained by Trustrum for the density and pressure field is drastically altered if a small viscosity is retained in the transient analysis. (Jerome-Vanderbilt)

MAINTENANCE OF GREAT SOUTH BAY AND PATCHOGUE RIVER, NEW YORK, NAVIGA-TION PROJECT (FINAL ENVIRONMENTAL STATEMENT).

Army Engineer District, New York.

Available from NTIS, Springfield, Va. 22151 as EIS-NY-73-0071-F Price \$3.00 printed copy; \$1.45 microfiche. September 1972. 18 p.

Descriptors: *Dredging, *Waste disposal, *En-vironmental effects, *New York, Spoil banks. Identifiers: *Environmental Impact Statements, *Great South Bay (NY), Patchogue River (NY).

Maintenance dredging of the existing Federal navigation project in Great South Bay and Patchogue River, New York, to its authorized pro-Patchogue River, New York, to its authorized project dimensions will be performed by contract dredge with spoiling in an existing upland disposal site. The improvement would permit the continuation of efficient and safe delivery by water of petroleum products and other commodities yielding economic benefits to the surrounding communities. Adverse environmental effects which cannot be avoided are: temporary increase in turbidity during the dredging process, which would have an impact on the water quality and shellfish resources of the area; and spoiling in the upland site, which would continue to alter the natural environmental habitat of the waterfowl inhabiting the Swan Creek area. (Knapp-USGS) NEAR-SHORE RIPPLES: SOME HYDRAULIC

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RELATIONSHIPS, Windsor Univ. (Ontario). Dept. of Geography. A. S. Trenhaile. Journal of Sedimentary Petrology, Vol 43, No

Journal of Sedimentary Petrology, Vol 43, No 2, p 558-568, June 1973. 6 fig, 1 tab, 37 ref.

Descriptors: *Ripple marks, *Beaches, *Sedimentary structures, *Waves (Water), Hydraulic models, Wavelengths, Sedimentology, Surf, Regression analysis, Correlation analysis, Statistical methods.

cat metnods.

Sand ripples in shallow water with small fetch were analyzed in a wave tank to investigate some aspects of the relationship between ripple geometry and hydraulic parameters. Power spectral analysis demonstrated that ripple height and wavelength increase with wave height and decrease with water depth, such that although random fluctuations are present, ripple geometry tends to increase towards the breaker point. Bed mounds tend to cause ripples to increase in size on he waveward side and decrease on the leeward side. Ripple velocity was the least well explained of the ripple parameters investigated, although velocity was shown to be related to water depth and wave height. (Knapp-USGS) W73.13530

OSTLER LENSES: POSSIBLE ENVIRONMENTAL INDICATORS IN FLUVIAL GRAVELS AND CONGLOMERATES, Guelph Univ. (Ontario). Dept. of Land Resource

For primary bibliographic entry see Field 02J. W73-13539

DESIGN OF CASINGS AND SCREENS FOR WATER PRODUCTION AND INJECTION

Moss (Roscoe) Co., Los Angeles, Calif.

Moss (Roscoe) Co., Los Magara R. Moss, Jr. Paper presented at American Petroleum Institute Pacific Coast District Second Biennial Symposi-um, Anaheim, California, Dec 1964, 25 p, 8 ref, 8

Descriptors: *Water wells, Injection wells, *Well screens, *Design criteria, Southwest U.S., Well casings, Corrosion.
Identifiers: *Cable tool drilling, *Rotary-hydraulic drilling, Cone of depression, Double wall casing.

One of the most important contributing factors to development of the semiarid Southwestern United States has been the exploitation of the region's States has been the exploitation of the region's vast underground reservoirs. Casing and screen practices applied to the two basic well designs employed in the area are discussed. Consideration is given to installation, operation, and economic criteria for both cable-tool and rotary-hydraulic methods of well construction. (Campbell-NWWA) W77.13526. W73-13568

GROUND WATER DEVELOPMENT AND MANAGEMENT IN THE OWENS VALLEY, Department of Water and Power, Los Angeles, Calif. For primary bibliographic entry see Field 04B. W73-13569

8C. Hydraulic Machinery

ENERGY-RESOURCES, ENERGY-RESOURCES PRODUCTION, STIMULATION. Stanford Univ., Calif. Dept. of Civil Engineering. For primary bibliographic entry see Field 06D. W73-13214

CHARACTERISTICS OF CEOTHERMAL. RESOURCES, Geological Survey, Menlo Park, Calif.

ENGINEERING WORKS-Field 08 Hydraulic Machinery-Group 8C

For primary bibliographic entry see Field 03E. W73-13218

STEAM PRODUCTION AT THE GEYSERS STEAM PRODUCTION AT THE GEYSERS GEOTHERMAL FIELD. Union Oil Co. of California, Cloverdale. Big Geysers Station. For primary bibliographic entry see Field 03E. W73-13220

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DESIGN AND OPERATION OF THE GEYSERS POWER PLANT,
Pacific Gas and Electric Co., San Francisco, Calif.

J. P. Finney. In: Geothermal Energy-Resources, Production, in: Geothermat Energy-Resources, Production, Stimulation; Proceedings of Special Symposium of American Nuclear Society, June 19-20, 1972: Stan-ford University Press, Stanford, Calif., p 145-161, 1973. 6 fig, 1 tab, 5 ref.

Descriptors: *Geothermal studies, *Electric power, *Electric power demand, *Thermal power-plants, Electric power production, Hydrogeology,

Water resources development, Energy, Steam tur-Identifiers: *Geothermal power, *Power demand, *Geysers geothermal field (Calif).

The Pacific Gas and Electric Company has been The Pacific Gas and Electric Company has been engaged for 15 years in the design, construction, and operation of dry steam geothermal electric power generators at the Geysers, California. The lant's eight turbine generator units produce a net output of 290,000 kw. Two more 53,000-kw units output or 299,000 kw. 1900 more 33,000-kw units are scheduled to go into operation in 1973. And in 1974, after a single unit rated at 106,000 kw goes into service, the total net output of The Geysers Power Plant will be 502,000 kw, making it the largest geothermal power installation in the world.

The pressure-flow characteristics of the steam The pressure-flow characteristics of the steam wells vary, but in general the flowing wellhead pressures decrease with increased production rates. Shut-in pressure on the wells is 450-500 psi; and the steam has a constant enthalpy of 1,200-1,205 Btu per lb. The most economic utilization of the resource resulted with a turbine-inlet pressure of 100 psig and an exhaust pressure of 4 inches Hg absolute. The electric power output of the wells is at about its maximum under these turbine conditions. At higher pressures, the increased energy available from the steam is more than offset by available from the steam is more than offset by available from the steam is more than offset by the diminished steam-production rates from the wells. At the operating conditions selected, about 80% of ne steam flow is evaporated in the cooling tower. This means that the condensed exhaust from the turbine can be used as cooling tower makeup water. Power production costs compare favorably with fossil fuel steam-generating units. (See also W73-13214) (Knapp-USGS)

THE VAPOR-TURBINE CYCLE GEOTHERMAL POWER GENERATION, J. H. Anderson.

J. H. Anderson.
In: Geothermal Energy-Resources, Production, Stimulation; Proceedings of Special Symposium of American Nuclear Society, June 19-20, 1972: Stanford, Calif., p 163-175, 1973. 7 fig, 8 ref.

Descriptors: *Electric power, *Thermal power-plants, *Turbines, Electric power production, Geothermal studies, Energy, Equipment, Efficien-cies, Water pollution control. Identifiers: *Vapor turbines, Isobutane.

A new geothermal power process, the vapor tur-bine cycle, was developed to eliminate the disad-vantages inherent in the methods involving use of steam. In this process the hot water brought to the surface is passed through a heat exchanger, where it gives up heat to boil and superheat a high density vapor. The vapor then expands through a turbine to produce power and is recycled to the heat exchanger. The practical and economic ad-vantages of this process may be great enough to

turn the vast potential of geothermal energy into reality. Isobutane has the most favorable overall economics for developing power from water of about 325F. One of the important advantages of vapor turbine plant is that lower condensing temperatures can be used than are economically possible with a steam turbine plant. Since water at full pressure retains its gases in solution, the gases can be returned to the ground without danger of atmospheric pollution. (See also W73-13214) (K-napp-USGS) W73-13222

WATER FROM GEOTHERMAL RESOURCES. California Univ., Berkeley. Sea Water Conversion

For primary bibliographic entry see Field 03A.

STIMULATION OF GEOTHERMAL SYSTEMS. Division of Applied Technology (AEC), Washington, D.C.

ton, D.C.
A. H. Ewing.
In: Geothermal Energy-Resources, Production,
Stimulation; Proceedings of Special Symposium of
American Nuclear Society, June 19-20, 1972: Stanford University Press, Stanford, Calif, p 217-222,
1973. 1 fig, 5 ref.

Descriptors: *Geothermal studies, *Electric Descriptors: "Cootnermal studies, "Electric power, "Electric power demand, "Thermal power-plants, Electric power production, Hydrogeology, Water resources development, Energy, Steam tur-bines, Wells. Identifiers: "Geothermal power, "Well stimula-

One of the important problems in the development of geothermal resources is the necessity for prov or geothermal resources is the necessity for prov-ing reserves sufficient to justify the expense of constructing a powerplant directly at the site of a reservoir. The potential investment in the power-plant may be large compared to the investment al-ready made in the exploration phase. Increased well productivity promised by artificial stimulation may make such decisions easier. The main objectives of research on the development of geother-mal resources are (1) the ability to utilize the resource however it manifests itself in nature. (2) the technology necessary for efficient extraction of energy from the resource, (3) the ability to pre-dict the productivity and longevity of the resource, and (4) the ability to develop the resource in an en-vironmentally tolerable manner. (See also W73-1324) (Knapp-USGS)

GEOTHERMAL RESOURCES RESEARCH. National Science Foundation, Washington, D.C. Div. of Advanced Technology Applications. For primary bibliographic entry see Field 06D. W73-13232

GEOTHERMAL POWER STILL IFFY, For primary bibliographic entry see Field 03E. W73-13433

HEAT-TRANSFER AGENTS FOR HIGH-TE-MPERATURE SYSTEMS, General Electric Corporate Research and

General Electric Corp Research and Development, Schenectady, N.Y. J. R. Fried.

Chemical Engineering, Vol 80, No 12, p. 89-93, May 28, 1973. 10 fig. 2 tab, 33 ref.

Descriptors: *Heat exchangers, *Temperature, *Thermal conductivity, *Thermodynamic Descriptors: "Heat exchangers, "Temperature, "Thermal conductivity, "Thermodynamic behavior, "Pumping, Electric power production, Industrial plants, Facilities, Heat transfer, Heat flow, Thermal properties, Physical properties, Conduction, Fluid dynamics, Gases, Instrumenta-tion, Materials, Mechanical engineering.

In heat transfer processes with temperatures below 32 F and above about 3500 F substitute heat In heat transfer processes with temperatures below 32 F and above about 3500 F substitute heat transfer agents for water are sought. Selection of the proper heat transfer agent and design of the transfer system for processes between 350 and 1000 F are treated in detail. Vapor phase systems allow greater quantities of heat transfer per pound of medium while liquid phase systems are specified when temperature control is important. The primary concern in choosing a heat-transfer medium once the system phase has been chosen is to match the process temperature requirements with the temperature range of the fluids. Other considerations are inventory cost, toxicity and ecology, flammability, thermal stability, freezing point, corrosive and fouling characteristics and pumping costs. The composition, temperature range, physical properties and pumping cost comparisons of major commercial heat-transfer fluids are listed and discussed. Several different vapor phase and liquid phase systems are described and compared. Carbon steel is the recommended construction material for all parts of the heat-transfer system in all cases except for inorganic salts above 850 F, when stainless steels are suggested. (Jerome-Vanderbilt)

HEATING AND COOLING IN BATCH PROCESSES, Proctor and Gamble Co., Cincinnati, Ohio. For primary bibliographic entry see Field 05G. W73-13448

NOMOGRAMS SIMPLIFY DESIGN OF STEAM

A. Zanker. Power Engineering, Vol 75, No 5, p 52-55, May 1973. 3 fig. 1 tab.

Descriptors: *Steam, *Condensers, *Design data, *Cooling water, Mechanical engineering, Heat transfer, Condensation, Heat exchangers, Design, criteria, Data processing, Mathematics,

The basic factors and equations relating the quantity and temperatures of steam to be condensed, the temperatures of entering and leaving cooling waters, and the heat transfer rates through the tube walls are presented for designing surface steam condensers. Although the step by step solution of these relationships is laborious and requires frequent reference to tables, charts, or graphs, the frequent reference to tables, charts, or graphs, the three nomograms presented greatly simplify the procedure. The first nomogram presents heat transfer rate, tube characteristic factor, and the exponent for temperature calculation. The second nomogram determines the outlet water temperature. The third determines cooling water rate, total required tube surface area and the total length of required title surface area and the total rength of the tubes. An example is given for use of these nomograms. (Jerome - Vanderbilt) W73-13464

WITH EXCHANGERS ETHYLENE PLANTS, Schmidtsche Heissdampf G.m.b.H., Kassel (West Germany). For primary bibliographic entry see Field 08G. W73-13465

DUAL STRING DRILLING METHOD YIELDS IMPROVED SAMPLES, Dresser Industries, Inc., Dallas, Tex. Security En-

gineering Div. E. A. Kunneman.

E. A. Kunneman. In: Proceedings, 12th Symposium on Exploration Drilling, University of Minnesota, School of Min-ing and Metallurgical Engineering, Minneapolis, Minnesota, p 195-201, 1967.

Descriptors: Drilling, *Core drilling, Drilling fluids, Sampling, *Drilling equipment.

Field 08—ENGINEERING WORKS

Group 8C—Hydraulic Machinery

Identifiers: *Reverse circulation, *Dual string drilling, Diamond core bits, Core breaker.

The dual string drilling concept and the merits of this system as an exploration tool have been recog-nized for some time. Methods of conversion of standard rotary rigs to dual string rigs are discussed, along with the mechanisms of operation of the dual string. A comparison of conventional with dual string methods is given. New develop-ments in dual string drilling are also shown. (Campbell-NWWA) W73-13565

CORE ORIENTATION.

Christensen Diamond Products Co., Salt Lake City, Utah. W. F. Kempe.

In: Proceedings, 12th Annual Drilling and Blasting Symposium, University of Minnesota, School of Mining and Metallurgical Engineering, Minneapolis, Minnesota, p 161-182, 1967.

Descriptors: *Core drilling, Cores, *Sampling, Drilling, Logging (Recording), *Exploration, Mining, Methodology.
Identifiers: *Diamond drilling, *Core orientation,

Coring equipment, Petroleum industry, Construc-tion industry.

There is nothing more valuable to authoritative decision making than reliable data in sufficient quantity. For purposes of soil and substrata investigation several means are available. Those selected depend on the kind of information sought and on the type of formation to be studied. Each method accomplishes certain functions. Coring is the only direct method of formation evaluation. Coring is explored in some detail, with emphasis on in situ orientation of rocks. (Campbell-NWWA) W73-13567

8D. Soil Mechanics

A MATHEMATICAL MODEL FOR PRELIMI-EVALUATIONS OF CANDIDATE RESERVOIR SYSTEMS,

Army Engineer Waterways Experiment Station, Vicksburg, Miss.

I. I. Decell

Available from NTIS, Springfield, Va. 22151 as AD-756 119 Price \$3.00 printed copy; \$1.45 microfiche. Technical Report M-72-3, August 1972. 100 p, 19 fig, 5 tab.

Descriptors: *Engineering structures, *Reservoirs, *Pre-impoundment, *Reservoir design, *Mathematical models, Systems analysis, Inputoutput analysis, Hydrologic data, Costs, Evalua-Storage capacity, *West Virginia.
Identifiers: *Rowlesburg Reservoir (W Va).

A mathematical model system was developed to provide an expedient method of evaluating condidate reservoirs. The models can be used to perform both functional and cost evaluations. These evaluations can then be used for comparisons of candidate reservoirs. The formulation of the models and data requirements are discussed to evaluate alternate candidates to the Rowlesburg Reservoir, West Virginia. Examples of analyses of reservoir capacity, flood storage-flow augmenta-tion, and visitation are included. (Woodard-USGS) W73-13529

THEORY AND PROBLEMS OF WATER PER-COLATION.

Bureau of Reclamation, Denver, Colo.

C. N. Zangar. Bureau of Reclamation, Engineering Monograph No 8, 1953. 75 p, 57 fig, 8 tab.

Descriptors: *Groundwater movement, Percolation, Flow nets, Hydraulic gradient, *Dam design. Dam foundations, Membranes, Phreatic lines, *Analog models, Soil mechanics. Identifiers: *Radial flow, Steady state solutions, Exit gradients, Time-drawdown method.

The flow of ground water through dams and their foundations and the accompanying pressures and gradients that exist are examined. Several methods gradients that exist are examined. Several methods for determining the permeability of soil by field tests are explored as well as flow problems via electric analog experiments. Both experimental and analytical solutions are discussed in detail; appendices show case problems. (Campbell-NWWA) 1872, 1862.

8E. Rock Mechanics and Geology

INDUCTION AND GROWTH OF FRACTURES IN HOT ROCK,

Los Alamos Scientific Lab., N. Mex. For primary bibliographic entry see Field 08H. W73-13228

8F. Concrete

EFFECT OF CALCIUM LIGNOSULFONATE ON PROPERTIES OF CONCRETE AT EARLY AGES, Missouri Univ., Rolla.

For primary bibliographic entry see Field 05D. W73-13644

8G. Materials

FEASIBILITY OF PLASTIC FOAM PLUGS FOR LEAKING CHEMICAL TAINERS.

Rockwell International Corp., Canoga Park, Calif. Rocketdyne Div. For primary bibliographic entry see Field 05G.

PROJECT TUGBOAT: EXPLOSIVE EXCAVA-TION OF A HARBOR IN CORAL,

Army Engineer Waterways Experiment Station, Livermore, Calif. Explosive Excavation Research For primary bibliographic entry see Field 08H. W73-13212

W73-13444

WATER TREATMENT FOR HIGH PRESSURE BOILERS,

For primary bibliographic entry see Field 03F.

PREOPERATIONAL CLEANING OF HIGH PRESSURE STEAM SYSTEMS, Black and Veatch, Kansas City, Mo. For primary bibliographic entry see Field 03E.

DRY COOLING TOWER USES STEEL STRUC-

TURE, Hoterv, Budapest (Hungary). For primary bibliographic entry see Field 05D. W73-13451

WATER TREATMENT FOR HEATING AND PROCESS STEAM BOILERS, For primary bibliographic entry see Field 05F.

PROBLEMS WITH **EXCHANGERS** ETHYLENE PLANTS.

Schmidtsche Heissdampf G.m.b.H., Kassel (West Germany). H. R. Knulle.

Chemical Engineering Progress, Vol. 68, No 7, p 53-56, July 1972. 4 fig, 12 ref.

Descriptors: *Cooling, *Heat exchangers, *Opera-Descriptors: "Cooling, "Heat exchangers, "Opera-tion and maintenance, "Cornosion control, Heat transfer, Steam, Conduction, Heat flow, Thermal conductivity, Heat resistance, Boilers, Boiler feed water, Design criteria, Thermal stress, Equip-ment, Mechanical engineering, Reliability, Systems analysis, Heated water, Cooling water. Identifiers: Quench boilers.

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The design criteria necessary to fulfill the require-ments for reliability and safety for heat transfer in quench boiler systems are discussed. Formulas for heat transfer coefficients and the ratios of tube length to diameter for power are presented. Heat flow from cracked gas to water is not only determined by the heat transfer on the gas side, but also by heat resistance in the tube wall and between the ter and the wall. Heat resistance on the water side has an essential influence on the excess tem suce has an essential influence on the excess temperature of the tube. The elastic behavior of the heated tube is discussed according to the forces applied from outside the tube and by thermal stresses related to the heat flow through the tube wall. Good durability in a water/steam operation is only guaranteed if the natural passive layer on the water side is maintained. The formation of a magnetite layer, while it cannot halt corrosion, will alow it to a control of the control slow it to a point where it is not a major factor. Besides the mechanical design, feed water quality and methods of operation are important to equip-ment reliability. (Jerome - Vanderbilt) W73-13465

MAGNETIC TREATMENT OF WATER. Informatics, Inc., Rockville, Md.
For primary bibliographic entry see Field 05F. W73-13544

8H. Rapid Excavation

PROJECT TUGBOAT: EXPLOSIVE EXCAVA-TION OF A HARBOR IN CORAL,

Army Engineer Waterways Experiment Station, Livermore, Calif. Explosive Excavation Research W. C. Day.

W. C. Day. Available from NTIS, Springfield, Va 22151 as AD-754 534 Price \$3.00 printed copy; \$1.45 microfiche. Technical Report TR E-72-23, Februa-ry 1972. 205 p. 185 fig. 41 tab. 43 ref.

Descriptors: *Explosives, *Explosions, *Rock excavation, *Hawaii, *Harbors, Seismic studies, Environmental effects, Coastal engineering, Craters, Seismic waves, Coral.

A portion of a planned small-boat harbor in Kawaihae Bay, Hawaii, was explosively ex-cavated in a weak coral material. The charges were emplaced approximately 36 ft deep in the coral reef which was overlain with a water layer averag-ing approximately 6 ft in depth. Charges were spaced 100 and 120 ft apart. An additional array of spaced 100 and 120 ft apart. An additional array of sixteen 1/2-ton charges was subsequently emplaced and detonated to clear that portion of the channel. The detonations resulted in a channel varying in width from about 150 to 260 ft at a minimum project water depth of 12 ft. The berthing basin is almost a square area 400 ft on a side at the 12-ft water depth contour. The explosive craters were broad and shallow with no lips and were actually better suited to harbor excapand were actually better suited to harbor excapasive craters were broad and shallow with no lips and were actually better suited to harbor excava-tion than the less wide and deeper craters typical of dry land cratering detonations. The cratering mechanism appears to be one of densification of the coral through crushing and subsequent settling. Results of a wave measurement program, a study of the effect of the detonations on the marine environment, a ground-motion measurement program, a structures response study, an airblast measurement program, and a measurement program to determine the peak pressure and the acceleration and velocity of the water directly over the charge positions are also included. (Knapp-USGS) W73-13212

RECOVERY OF GEOTHERMAL ENERGY FROM HOT, DRY ROCK WITH NUCLEAR EX-PLOSIVES. lattelle-Northwest, Richland, Wash. Geothermal

Programs.
J. B. Burnham, and D. H. Stewart.

1. B. Burnam, and D. H. Stewart.
In: Geothermal Energy-Resources, Production, Stimulation; Proceedings of Special Symposium of American Nuclear Society, June 19-20, 1972: Stanford University Press, Stanford, Calif, p 223-230, 1973. 5 fig, 1 tab, 6 ref.

Descriptors: *Nuclear explosions, *Geothermal studies, *Electric power, Thermal powerplants, Water resources development. Identifiers: *Project Plowshare, *Geothermal

The Plowshare geothermal concept entails the generation of power from the energy contained in deposits of hot, dry rock. The rock is fractured by an array of sequentially fired, fully contained nuclear explosives; when fracturing is complete, nuclear explosives; when fracturing is complete, water is injected through fill pipes and steam is withdrawn to the surface facility. One cubic mile of rock at 350C, when cooled to 150C, would yield a usable energy equivalent to that of 300 million barrels of oil-an amount, at present oil prices, worth approximately \$1\$ billion. (See also W73-13214) (Knapp-USGS)

EXPLOSIVE STIMULATION OF HYDROTHER-

MAL RESERVOIRS, Stanford Univ., Calif. Dept. of Petroleum En-

gineering.
H. J. Ramey, Jr., P. Kruger, and R. Raghavan.
In: Geothermal Energy—Resources, Production, Stimulation; Proceedings of Special Symposium of American Nuclear Society, June 19-20, 1972: Stanford University Press, Stanford, Calif, p 231-249, 1973. 5 fig, 2 tab, 11 ref.

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Identifiers: *Geothermal power, *Well stimula-

The stimulation of geothermal fluid production from hydrothermal aquifers for producing steam to generate electricity appears to be technically feasible. Several methods of production are possito generate electricity appears to be technically feasible. Several methods of production are possible to optimize the recovery of the heat stored in the geothermal aquifer. Explosive stimulation is one of the more promising methods. For surface excavations with shallow depth burial, chemical explosives have proved useful in yields of up to around 5 kt. In deeper formations, the emplacement of large volumes of explosives and the higher formation temperatures limit the practical explosive yield. Nuclear explosives, which become more efficient in size and cost for yields above about 3 kt, have proved useful for large-volume fracturing of underground formations. Special nuclear explosives are being designed for use in deep emplacement wells of diameters usually used by the oil and gas industry. Methods for the optimum removal of geothermal fluids must be based on a thorough knowledge of the recovery mechanisms operating within the reservoir, including fluid expansion, liquid vaporization, and the segregation of liquid and vapor, as well as the in-flux of fluids from adjacent or underlying aquifer. The deposition and production of minerals must be considered, as well as the environmental effects due to the explosion and subsequent geotherms production. (See also W73-13214) (Knapp-USGS) W73-13227

INDUCTION AND GROWTH OF FRACTURES IN HOT ROCK, Los Alamos Scientific Lab., N. Mex. M. Smith, R. Potter, D. Brown, and R. L. Aamodt. In: Geothermal Energy-Resources, Production, Stimulation; Proceedings of Special Symposium of American Nuclear Society, June 19-20, 1972: Stanford University Press, Stanford, Calif. p 251-268, 1973. 8 fig, 1 tab, 16 ref.

Descriptors: "Geothermal studies, "Electric power, "Electric power demand, "Thermal power-plants, Electric power production, Hydrogeology, plants, Electric power production, Market resources development, Energy, Steambines, Wells.

Identifiers: *Geothermal power, *Well stimulation, *Hydraulic fracturing

Widespread use of geothermal energy will be facilitated if a way can be found to produce it from hot, relatively dry rock by circulating a fluid introduced from the surface through the rock and bringing the heated fluid (probably water) back to orning the nearest must proposely water; base in the surface. Some concepts of how this might be done are discussed. Hydraulic fracturing is begun by pumping water from the surface into a borehole. When the borehole becomes sufficiently borehole. When the borehole becomes sufficiently pressurized, a tensile crack will form somewhere along its margin. The fracture will grow as the pumping continues, and will continue to grow as long as water can be pumped in fast enough to exceed the leakage taken off by the permeability of the rock. Thermal stresses will create new cracks, preferentially near the source of the first one, where the water is coldest, and these cracks may also proposets under the high pressure sweeted at also propagate under the high pressure exerted at that point. At the present state of the drilling art, it that point. At the present state of the gruing art, is would probably not be practical to drill holes deeper than about 20,000 ft. (See also W73-13214) (Knapp-USGS) W73-13228

CHEMICAL EXPLOSIVE STIMULATION OF GEOTHERMAL WELLS, Naval Weapons Center, China Lake, Calif.

Research Dept.

C. F. Austin, and G. W. Leonard. In: Geothermal Energy-Resources, Production, Stimulation; Proceedings of Special Symposium of American Nuclear Society, June 19-20, 1972: Stanford University Press, Stanford, Calif, p 269-292, 1973. 14 fig, 14 ref.

Descriptors: *Geothermal studies, *Explosives, *Water wells, Wells, Injection wells, Electric power, Thermal powerplants, Hydrogeology, Water resources development. Identifiers: *Geothermal power, *Well stimula-

Explosive stimulation of geothermal wells appears to be feasible with today's technology. Blasti a bore hole can increase the flow rates into the hole. The increase is accomplished by destruction of grain-to-grain bonding, by destruction of physical blockages of fractures and pores, or by the cal blockages of fractures and pores, or by the creation of entirely new fractures. The use of explosive charges to increase the effective diameter of a well through fracture propagation or to enhance the nearby porosity has the advantages that the equipment required is minimal, little weight need be handled, and little or no junk is likely to remain in the hole. To be successful, the explosive stimulation of a geothermal well requires the careful understanding and matching of three major factors: (1) the method of explosive energy delivery: (2) the type of host rock: and (3) energy delivery; (2) the type of host rock; and (3)

the fluid phase in the formation. (See also W73-13214) (Knapp-USGS) W73-13229

ENVIRONMENTAL ASPECTS OF NUCLEAR

STIMULATION, Utah Univ., Salt Lake City. Dept. of Mechanical

Gran Colly, San Lake City, Dept. of Sectional Colly, Bept. of Sectional Colly, G. M. Sandquist, and G. A. Whan.

In: Geothermal Energy—Resources, Production, Stimulation; Proceedings of Special Symposium of American Nuclear Society, June 19-20, 1972: Stanford University Press, Stanford, Calif., p 293-313, 1973. 5 fig, 2 tab, 30 ref.

Descriptors: *Environmental effects, *Nuclear explosions, *Wells, *Geothermal studies, Thermal powerplants, Water pollution sources, Radioactive wastes, Seismic studies.

Identifiers: *Well stimulation, *Geothermal

Because the development of geothermal energy resources is attractive from environmental and economic standpoints, the utilization of nuclear explosives to stimulate latent geothermal sites merits examination. However, the contained underground detonation of one or more nuclear devices raises considerable questions and problems that demand critical evaluation. Deep dry-rock stimulation seems at this time to favor the use of very large (200- to 1,000-ki) explosives, which would produce severe environmental impact from seismic effects. Geothermal aquifer stimulation would make use of smaller nuclear devices, but because of the probable affinity to tectonic plate boundaries of the geologic formations addressed by this application, the potential environmental impact of radioactive contamination would be a serious concern, as would possible induced seismic fault movement. The excellent safety record of the Plowshare Program is reassuring. There have been no personal injuries, only minor damage to structures, and minimal impact on the environment attributable specifically to the detonations. (See also W73-13214) (Knapp-USGS) W73-13230

CORROSION AND SCALING IN NUCLEAR-STIMULATED GEOTHERMAL POWER

California Univ., Livermore. Lawrence Livermore Lab.
O. H. Krikorian.

In: Geothermal Energy-Resources, Production, Stimulation; Proceedings of Special Symposium of American Nuclear Society, June 19-20, 1972: Stan-ford University Press, Stanford, Calif, p 315-334, 1973. I fig. 5 tab, 22 ref.

Descriptors: *Environmental effects, *Nuclear explosions, *Wells, *Geothermal studies, *Corrosion, *Scaling, Thermal powerplants, Water pollution sources, Radioactive wastes, Seismic studies. *Well stimulation, *Geothermal

The experience gained with corrosion and scaling in natural geothermal powerplants makes it apparent that similar problems are likely to be encountered with nuclear stimulation. These problems can be explored more fully by performing exposure tests on alloy coupons in geothermal steam and water under the proposed nuclear application conditions. It is important in such tests that the compositions of the steam and the water be representative of the particular geothermal formation. Steam taken directly from a nuclear well tion. Steam taken directly from a nuclear well would be most desirable; or, lacking an actual well, it may be possible to infer the impurities to be expected in the steam from analyses of core samples from the formation. It seems likely, as has been the case for natural geothermal wells, that suitable alloys and other construction materials for turbine systems can be found through such screening tests. (See also W73-13214) 9Knapp-USGS)

Field 08-ENGINEERING WORKS

Group 81 - Fisheries Engineering

W73-13231

81. Fisheries Engineering

MARICULTURE COMES OF AGE,

H. S. Gordon.

Chemical Engineering, Vol 79, No 17, p. 26-28, August 7, 1972. 1 fig.

Descriptors: "Aquiculture, "Marine fisheries, "Research and development, "Heated water, Marine biology, Chemistry, Marine animals, Shrimp, Oysters, Lobsters, Salmon, Shellfish farming, Economics, Model studies, Experimental farms, Prototypes, Technology, Utilities, Thermal powerplants, Reproduction, Effluents, Cycles, Growth rates, Sewage, Algae.

Current state of development of and future possibilities are reviewed for the controlled cultivation of seafood stocks-mariculture. Experiments which are underway examine the possibilities for controlled environment hatcheries which would optimize the reproduction and maturation cycles of shrimp, oysters, lobsters and salmon. Experiments for salmon cultivation have shown signs of success, but the prime interest of U.S. companies centers on shrimp. Several large corporations have made investigations of shrimp production and Texas A and M University in cooperation with Central Power and Light Company of Texas is planning studies to determine the effects of high local salinity on shrimp growth and development, the effects of salinity on shrimp under different feeding conditions, and the feasibility of shrimp production on a 1,150 acre man-made cooling lake. Utilities have been investigating the possibility of mariculture in their thermal effluents. Sewage may prove useful for algae farms, which would provide food for mariculture projects. Some technical problems involved in mariculture are the reconditioning of hatchery water, the prevention of disease and the development of equipment resistant to salt water corrosion. (Jerome-Vanderbilt) W73-13452

TESTS OF VARIATIONS OF THE ABERNATHY SALMON DIET, 1970,

Bureau of Sport Fisheries and Wildlife, Longview,

Wash. Salmon-Cultural Lab.
L. G. Fowler, J. L. Banks, and J. W. Elliott.

U S Bur Sport Fish Wildl Tech Pap, 61, p 3-13, 1972, Illus.

Identifiers: *Abernathy salmon, Germ, Oncorhynchus-tshawytscha, *Salmon diet, Tests, Wheat, Feeding trials.

The 1970 fall chinook salmon (Oncorhynchus tshawytscha) feedding trials indicated that dry pelleted diets were equal to moist pelleted diets with similar formulations. A superior diet was produced by reducing the ratio of dried whey product and wheat germ meal to 1:1 and eliminating cottonseed meal. This formulation fed at a 45% protein level was more efficient than other protein levels fed. Growth was not reduced when the soybean oil supplement was lowered from 6% to 2% of the diet. Two corn distillers' products that were substituted as partial replacements for dried whey product did not enhance fish growth. Storage of the Abernathy dry pellet at room temperature did not alter the nutritional adequacy of the diet.—Copyright 1973, Biological Abstracts, Inc. W73-15499.

09. MANPOWER, GRANTS AND FACILITIES

9D. Grants, Contracts, and Research Act Allotments

ANNUAL REPORT. 1971-1972. NEW JERSEY WATER RESOURCES RESEARCH INSTITUTE. Rutgers - The State Univ., New Brunswick, N.J. Water Resources Research Inst.

August 1972. 94 p, 4 fig, 118 ref. OWRR A-999-NJ (9).

Descriptors: "New Jersey, "Research, "Projects, Water pollution control, Hydrology, Hydraulics, Estuaries, Biological oxygen demand, Salinity, Water quality, Environmental effects, Oysters, Sites, Development, Waste discharge, "Water resources Institute. Identifiers: "Delaware Estuary.

Research progress and prospects are summarized for 1971-1972. Projects concerning hydrology and hydraulics, environmental impacts of man's activities, stream oxygenation and BOD, othe pollution and biological problems, and institutional and political studies are discussed. Specific topics that deal with estuaries include: the effects of salinity and other water quality parameters on NJ. oyster beds; evaluation of estuarine site development lagoons; the Delaware estuary system; spatially and temporally distributed discharge of effluents in estuaries; and atmospheric aeration in an estuary. (Ensign-PAI) W73-13545

10. SCIENTIFIC AND TECHNICAL INFORMATION

10A. Acquisition And Processing

CHANGING TIMES FOR WATER RESEARCH AND TECHNOLOGY TRANSFER, Nebraska Univ., Lincoln. Water Resources Research Inst. For primary bibliographic entry see Field 06B. W73-13038

10C. Secondary Publication And Distribution

NITRIFICATION AND DENTRIFICATION - A SELECTED BIBLIOGRAPHY, North Carolina Univ., Chapel Hill. Dept. of Environmental Sciences and Engineering. For primary bibliographic entry see Field 05B. W73-13085

TRENDS IN METHODOLOGY FOR EVALUA-TION OF EFFECTS OF POLLUTANTS ON MARINE ORGANISMS AND ECOSYSTEMS, Fisheries Research Board of Canada, West Vancouver, (British Columbia). Pacific Environment Inst. For primary bibliographic entry see Field 05C.

A LITERATURE SURVEY OF OCEAN POLLUTION.

TION, Catholic Univ. of America, Washington, D.C. Inst. of Ocean Science and Engineering. For primary bibliographic entry see Field 05B. W73-13211 AQUATIC, BIOENVIRONMENTAL STUDIES IN THE COLUMBIA RIVER AT HANFORD 1945-1971. A BIBLIOGRAPHY WITH ABSTRACTS, Battelle-Pacific Northwest Labs., Richland, Wash.
For primary bibliographic entry see Field 05B.

RADIOACTIVE WASTE MANAGEMENT - A BIBLIOGRAPHY OF PUBLICLY AVAILABLE LITERATURE PERTAINING TO THE USACC'S HANFORD, WASHINGTON PRODUCTION SITE.

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Technical Information Center (AEC), Oak Ridge, Tenn. For primary bibliographic entry see Field 05B. W73-13414

SELECTED IRRIGATION RETURN FLOW QUALITY ABSTRACTS 1970-1971, SECOND ANNUAL ISSUE, Colorado State Univ., Fort Collins. Dept of Agricultural Engineering. For primary bibliographic entry see Field 05G. W73-13472

THERMAL EFFECTS ON AQUATIC ORGAN-ISMS, ANNOTATED BIBLIOGRAPHY OF 1971 LITERATURE, Oak Ridge National Lab., Tenn.

Oak Kuuge National Lab., Tenn. For primary bibliographic entry see Field 05C. W73-13478

10F. Preparation of Reviews

TRENDS IN METHODOLOGY FOR EVALUA-TION OF EFFECTS OF POLLUTANTS ON MARINE ORGANISMS AND ECOSYSTEMS, Fisheries Research Board of Canada, West Vancouver, (British Columbia). Pacific Environment Inst. For primary bibliographic entry see Field 05°C. W73-13171

ECOLOGICAL EFFECTS OF OFFSHORE DREDGING AND BEACH NOURISHMENT: A REVIEW, University of Southern Mississippi, Hattiesburg.

REVIEW, University of Southern Mississippi, Hattiesburg. For primary bibliographic entry see Field 05C. W73-13290

LITERATURE PERTAINING TO WATER QUALITY AND QUANTITY IN UNSATURATED POROUS MEDIA,
Arizona Univ., Tucson. Dept. of Hydrology and

Water Resources. For primary bibliographic entry see Field 05B. W73-13302

POTENTIAL FOR THE USE OF COBALT-60 IR-RADIATION IN THE TREATMENT OF WASTE WATERS, North Carolina Univ., Chapel Hill. Dept. of En-

North Carolina Univ., Chapel Hill. Dept. of Environmental Sciences and Engineering. For primary bibliographic entry see Field 05D. W73-13401

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24-D Avoidance of Pesticides by Grass Shrimp	First Data on the Water Regime of Plants From Southern Mongolia, (In Russian),	Surface Adsorption: A Promising Approach for the Treatment of Tannery Effluents,
(Palaemonetes pugio), W73-13173 5C	W73-13607 21	W73-13648 5D
W/3-131/3	Evaluation and Development of Physical-	ADVECTION
ABALONE	Chemical Techniques for the Separation of	Warm Water Advection in the Southern Beau-
Laboratory Observations on the Early Growth	Emulsified Oil from Water,	fort Sea August-September 1971.
of the Abalone, Haliotis Sorenseni, and the Ef-	W73-13642 5D	W73-13466 2E
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and Settling Success,	ABSTRACTS	AERATION
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A B A TEMPAT COURDING DO	raphy of Publicly Available Literature Pertain-	W73-13321 5D
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Pollution Abatement Programs in the Delaware River Estuary,	Production Site.	Aerators,
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W/3-13104	4 company	
ABERNATHY SALMON	ACCIDENTS	Method for Treating Acid Water Containing
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Diet, 1970,	Leaking Chemical Containers, W73-13019 SG	W73-13335 5D
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Average Albedo Values of Glaciers During the	and the Statistical Comparison of Measuring	AERIAL PHOTOGRAPHY
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bedo lednikov v period ablyatsii),	W73-13194 7A	System for the Detection of Oil on Water,
W73-13357 2C	'A	W73-13167 SA
ABRAMOV GLACIER	ACID MINE WATER	The last transfer of the last transfer of
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siologiya Sredney Azii).	Metallic Values,	Dar'ya River Basin from Aerial Photographic
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ABRAMOV GLACIER (USSR)	ACTIVATED CARBON	materialam aerofotos'yemki 1946-1966 gg.),
Meteorological Conditions in the Abramov Gla-	Process Design Manual for Carbon Adsorption.	W73-13359 2C
cier Basin (Meteorologicheskiye usloviya bas-	W73-13131 5D	and the second s
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W73-13351 2C	A Little Phenol Stirs up a Lot of Public Rela-	Polarization: A Key to an Airborne Optical
	tions,	System for the Detection of Oil on Water,
Heat Balance of Surfaces of the Abramov Gla-	W73-13550 5F	W73-13167 5A
cier and Lateral Moraine in Summer (Teplovoy	Different of all Adjustment Hann Assigned Con-	A MERCANDE DE COMPANIO DE COMP
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beregovoy moreny v letniy period),	bon Adsorption of Dissolved Organics from In- dustrial Effluents,	Effect of Dyes on Bacterial Growth,
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het massy lednika Abramova),	Treatment of Glue Factory Wastes by	Screening and Aerating Concentrator,
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Suspended-Sediment Yield from the Abramov		AESTHETICS
Glacier Basin (Stok vzveshennykh nanosov s	ACTIVATED SLUDGE	Attitudes of Riparians Towards Their Lake En-
basseyna lednika Abramova),	Activated Sludge Modifications for Enhance-	vironments: A Study of Lake Wyola and
W73-13355 2C	ment of Trickling Filter Plant Performance. I.	Damon Pond, Massachusetts,
But - Counties of the About Chair	Design, Operation, and BOD Removal in the	W73-13007 6A
Radar Sounding of the Abramov Glacier (Radiolokatsionnoye zondirovaniye lednika	Units. II. Nitrification,	
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W73-13356 2C	Aceston	Study, Appendix B-Aesthetic and Cultural
H 13-13330 2C	Aerators,	Values.
ABSORPTION	W73-13324 5D	W73-13482 6B
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Ephemera Danica (Ephemeroptera) in Continu-	Environmental Legislation: How it Affects	Conservation of the Great Lakes of East
ous-Flow Systems,	Fossil-Fuel-Fired Power-Generating Equip-	
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W73-13404 5C	Continuous Bubble Fractionation: Part I,	Agricultural Characteristics of the Bottom
	Theoretical Consideration,	Land of DNEPR River, (In Byelorussian),
Methodology for the Identification of a Biologi-	W73-13639 5D	W73-13578 3F
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CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- Ground and surface water hydrology at the Water Resources Division of the U. S. Geological Survey, U. S. Department of the Interior.
- Metropolitan water resources planning and management at the Center for Urban and Regional Studies of University of North Carolina.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Eutrophication at the Water Resources Center of the University of Wisconsin.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Water resource aspects of the pulp and paper industry at the Institute of Paper Chemistry.

Supported by the Environmental Protection Agency in cooperation with WRSIC

- Thermal pollution at the Department of Sanitary and Water Resources Engineering of Vanderbilt University.
- Wastewater treatment and management at the Center for Research in Water Resources of the University of Texas.
- Methods for chemical and biological identification and measurement of pollutants at the Analytical Quality Control Laboratory of the Environmental Protection Agency.
- Coastal pollution at the Oceanic Research Institute.
- Water treatment plant waste pollution control at American Water Works Association.
- Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University.
- Agricultural livestock waste at East Central State College, Oklahoma.

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WATER QUANTITY MANAGEMENT AND CONTROL

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